BUILDER FORUM SERIES

AIRTIGHTNESS

Township of Langley

Est. 1873

CITY OF SURREY

the future lives here.

Township of Langley

Est. 1873

BC Energy Step Code Implementation Update

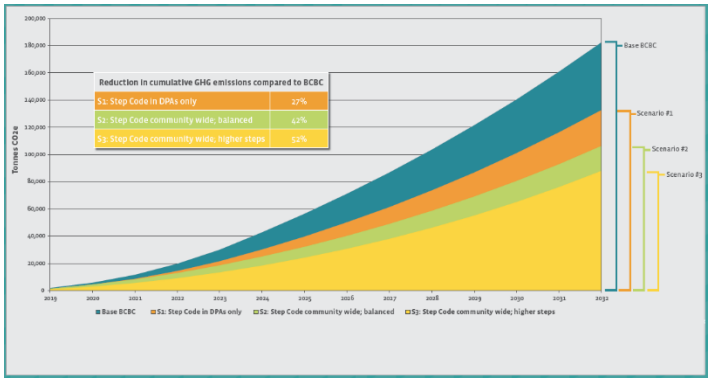
Robert Baker | Assistant Chief Inspector
Nick Schock | Building Energy Manager

April 25, 2019

TOL Step Code – Adoption Overview

The Township of Langley will require all new buildings with residential units to comply with the BC Energy Step Code:

- **Effective January 1st, 2019**
  - Step 2 for Development Permit Areas for GHG's
    - Latimer, Carvolth, Brookswood / Fernridge, etc
  - Step 1 for non-Development Permit Areas for GHG's
    - Focus on the Lower Steps for now



TOL Step Code - Adoption Timeline

Baseline BCBC

Inside Development Permit Areas

	2019	2020	2021	2022+
Part 9	2	2	3	3
Part 3	2	2	3	3

Outside Development Permit Areas

	2019	2020	2021	2022+
Part 9	1	2	2	3
Part 3	1	2	2	3

- 2019 to 2022 adoption model utilizes Lower Steps
- 2022+ will consider Higher Steps, dependent upon industry compliance
- Consideration for BCBC 9.36 increases in baseline performance

TOL Step Code – Comprehensive Preparation for Adoption

Leading up to the adoption of the Step Code, the Township developed and executed a comprehensive plan for adoption:

- Create and update necessary documents
- Develop internal processes
- Deliver staff training modules
  - Plan review
  - Inspectors
  - Clerical staff
- Update incentives program
- Industry engagement
  - Stakeholder engagement and consultation
  - Builders Breakfast

TOL Step Code - Website

All required information for Step Code projects can be found on the TOL Step Code website – tol.ca/stepcode :

- Step Code BP application documents:
  - Part 9 Pre-construction / As-built
  - Part 3 Energy Intensity Report / Design Intent Letter
- Available Incentives
  - Energy modelling (limited time offer)
  - Mid-construction blower door testing
  - Rebate offerings for Part 9 Upper Steps (Steps 4 & 5)
- Historic information – Bylaw 5385 and Report to Council 18-71

Township of Langley Step Code Bulletin

Step Code bulletin released (and posted to website) to address specific issues:

- Township of Langley Step Code forms
  - Abbotsford weather data
  - Metric units
- Energy modeling guidance for Part 9 multifamily projects
  - Whole-building energy modeling approach is required
- Airtightness assumptions and design detail requirements

Air Barrier Details on Drawings

Air barrier details are required on drawings.
To use improved airtightness (<2.5 ACH50):

- Especially for improved airtightness (<2.5 ACH50)
- This location and transitions of the air barrier are indicated on the drawing in red or pink

Coordination and use of air barrier details with trades in field is critical to constructing air barrier to reflect modelling assumptions

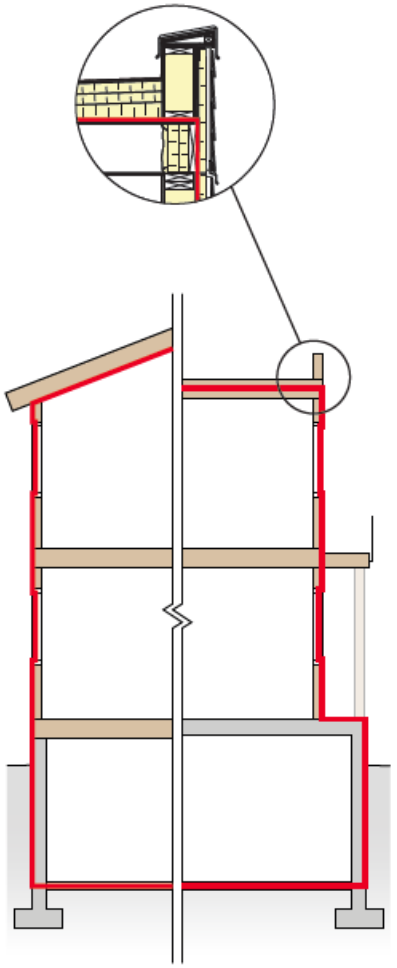


Image: BC Housing Step Code Builder Guide

Step Code Forms – Part 9

The Step Code forms:

1. "Translate" the inputs and outputs of the energy model
2. Verify that the Step Code targets are achieved by the proposed design and as-built construction
3. Act as a "sign-off" by the Energy Advisor
   i. Pre-construction and As-built stage
   ii. Energy Advisor is not a registered professional, but will have E&O insurance
4. Provides references for plan review and inspections to determine compliance, such as:
   - Type of assemblies and RSI values
   - Window U-value and SHGC
   - Equipment type and efficiencies
   - **Ventilation rates**

Township of Langley

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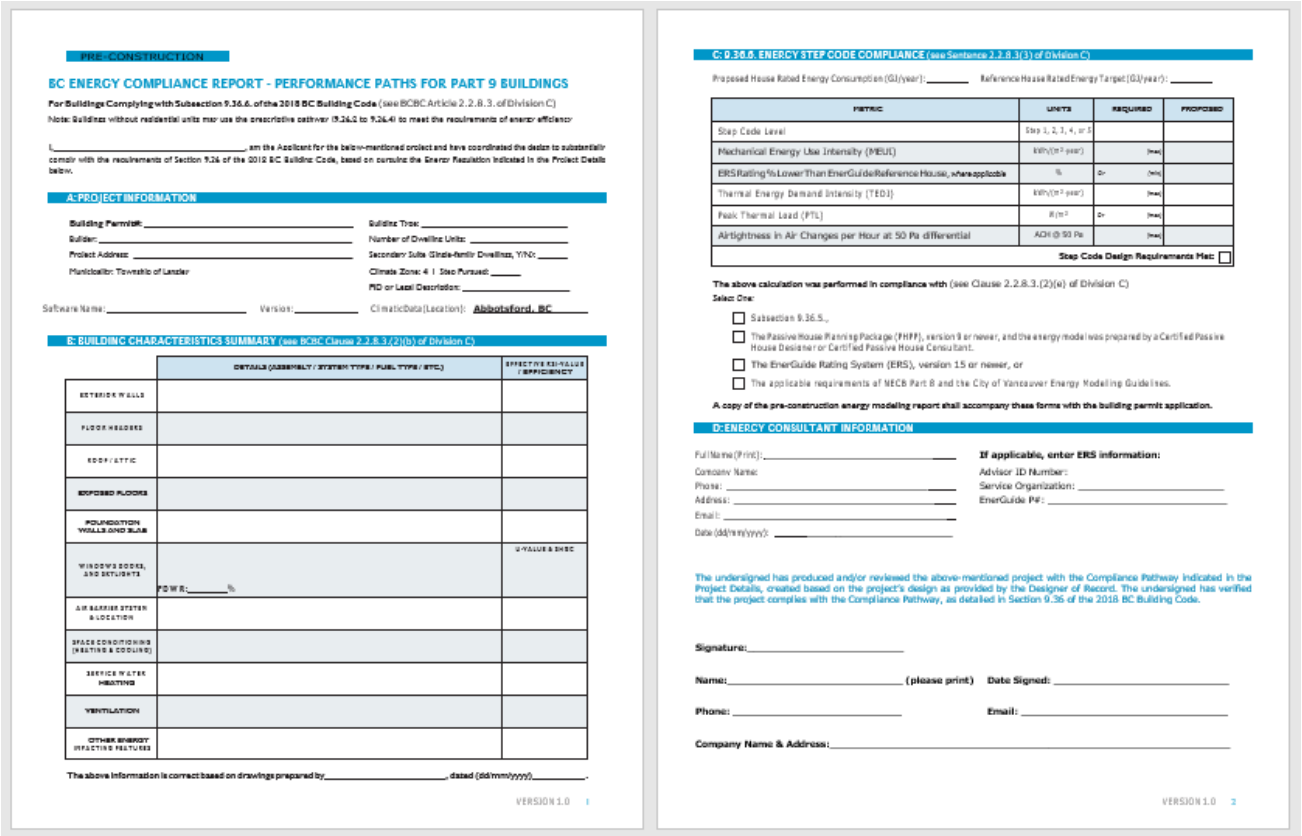
Step Code Forms – Part 9

These forms provide a roadmap for the plan review and inspection process with the shift from prescriptive to performance compliance.



PRE-CONSTRUCTION

BC ENERGY COMPLIANCE REPORT - PERFORMANCE PATHS FOR PART 9 BUILDINGS

For Buildings Complying with Subsection 9.36.6. of the 2018 BC Building Code (see BCBC Article 2.2.8.3. of Division C)

Note: Buildings without residential units may use the prescriptive pathway (9.36.2 to 9.36.4) to meet the requirements of energy efficiency

I, _____, am the Applicant for the below-mentioned project and have coordinated the design to substantially comply with the requirements of Section 9.36 of the 2012 BC Building Code, based on pursuing the Energy Regulation indicated in the Project Details below.

A: PROJECT INFORMATION

Building Permit#: _____ Building Type: _____

Builder: _____ Number of Dwelling Units: _____

Project Address: _____ Secondary Suite (Single-family Dwellings, Y/N): _____

Municipality: Township of Langley Climate Zone: 4 | Step Pursued: _____

PID or Legal Description: _____

Software Name: _____ Version: _____ Climatic Data (Location): **Abbotsford, BC**

B: BUILDING CHARACTERISTICS SUMMARY (see BCBC Clause 2.2.8.3.(2)(b) of Division C)

	DETAILS (ASSEMBLY / SYSTEM TYPE / FUEL TYPE / ETC.)	EFFECTIVE RSI-VALUE / EFFICIENCY
EXTERIOR WALLS		
FLOOR HEADERS		
ROOF / ATTIC		
EXPOSED FLOORS		
FOUNDATION WALLS AND SLAB		
WINDOWS DOORS, AND SKYLIGHTS	FDWR: _____ %	U-VALUE & SHGC
AIR BARRIER SYSTEM & LOCATION		
SPACE CONDITIONING (HEATING & COOLING)		
SERVICE WATER HEATING		
VENTILATION		
OTHER ENERGY IMPACTING FEATURES		

The above information is correct based on drawings prepared by _____, dated (dd/mm/yyyy) _____.

VERSION 1.0 1

C: 9.36.6. ENERGY STEP CODE COMPLIANCE (see Sentence 2.2.8.3.(3) of Division C)

Proposed House Rated Energy Consumption (GJ/year): _____ Reference House Rated Energy Target (GJ/year): _____

METRIC	UNITS	REQUIRED	PROPOSED
Step Code Level	Step 1, 2, 3, 4, or 5		
Mechanical Energy Use Intensity (MEUI)	kWh/(m² year)	[max]	
ERS Rating % Lower Than EnerGuide Reference House, *where applicable*	%	0+ [min]	
Thermal Energy Demand Intensity (TEDI)	kWh/(m² year)	[max]	
Peak Thermal Load (PTL)	W/m²	0+ [max]	
Airtightness in Air Changes per Hour at 50 Pa differential	ACH @ 50 Pa	[max]	
		Step Code Design Requirements Met: ☐	

The above calculation was performed in compliance with (see Clause 2.2.8.3.(2)(a) of Division C)

Select One:

- ☐ Subsection 9.36.5.,
- ☐ The Passive House Planning Package (PHPP), version 9 or newer, and the energy model was prepared by a Certified Passive House Designer or Certified Passive House Consultant.
- ☐ The EnerGuide Rating System (ERS), version 15 or newer, or
- ☐ The applicable requirements of NECB Part 8 and the City of Vancouver Energy Modeling Guidelines.

A copy of the pre-construction energy modeling report shall accompany these forms with the building permit application.

D: ENERGY CONSULTANT INFORMATION

Full Name (Print): _____

Company Name: _____

Phone: _____

Address: _____

Email: _____

Date (dd/mm/yyyy): _____

If applicable, enter ERS information:

Advisor ID Number: _____

Service Organization: _____

EnerGuide #: _____

The undersigned has produced and/or reviewed the above-mentioned project with the Compliance Pathway indicated in the Project Details, created based on the project's design as provided by the Designer of Record. The undersigned has verified that the project complies with the Compliance Pathway, as detailed in Section 9.36 of the 2018 BC Building Code.

Signature: _____

Name: _____ **(please print)** **Date Signed:** _____

Phone: _____ **Email:** _____

Company Name & Address: _____

VERSION 1.0 2

Township of Langley
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Success Stories

Murrayville
Step 5 / Net-Zero
Owner-Builder

Fort Langley
Certified Passive House
0.2 ACH50

Step Code Implementation: Consistency of Information

Coordination of information between the builder, Energy Advisor, and designer is key.

- What type of insulation is being used?
- RSI calculations
- In practice, this means an integrated design process should be used and the design drawings must incorporate energy modeling data
- The Energy Advisor may make suggestions to the builder, but from a compliance standpoint, the model must match the drawings

The energy model must be updated if changes are made to the design during construction

Step Code Implementation: Step 1 and Step Code Metrics

Step 1 is different:

- Step 1 requires compliance with 9.36 Performance Path
  - No TEDI, MEUI, or pass/fail airtightness targets
  - Simply put, the house must demonstrate less energy consumption than the code Reference House
- Calculation of the Step Code metrics is required for Step 1
  - Even though they are not used for compliance

Step Code Implementation: Ventilation

The ventilation reported in the energy model must at least meet the 9.32 requirements.

- Sometimes the ventilation rate in the model is lower than the code requirement
- This means the TEDI is artificially low
- The Township added the ventilation rate to our Step Code forms

Step Code Implementation: Multi-family

Ironing-out the wrinkles: the Step Code addresses code compliance at the **building** level, while the EnerGuide Rating System provides an evaluation at the **unit** level.

- Energy modeling guidelines to better align the Step Code and the ERS are in development
- A provincial working group is currently reviewing a proposed solution to this issue
- The Township has provided temporary energy modeling guidelines for Energy Advisors until a solution from the Province is available

Step Code Implementation: Large Houses and TEDI

So far, it appears that the commonly used design for large houses may have difficulty at the higher Steps of the Step Code.

- Typical TEDIs range from 45 to 65 kWh/m^2·year
- Step 1 has no minimum TEDI gateway
- Step 2 will require a TEDI ≤ 35 kWh/m^2·year

TOL Step Code - Incentives

Incentives are available through the TOL Green Building Rebate Program:

- Energy modeling
  - $300 single-family
  - $150 (per unit) multi-family (1st 25% of project)
- Mid-construction Blower Door Testing:
  - $350 for single family dwellings
  - $350 per unit for townhouse developments (1st 25% of project)
- Upper Steps:
  - Step 4: $1000 (single-family), $300 / dwelling unit (multi-family)
  - Step 5: $1500 (single-family), $500 / dwelling unit (multi-family)

Other industry offerings, as available – Hydro, Fortis, etc.

Step Code Implementation: Uptake of Incentives Program

How many projects have used the available incentives?

- Since inception, about 200 projects have taken advantage of the Township's Green Building incentives program
- A high level of participation in the Township's mid-construction blower door testing incentive program is anticipated

Step Code Implementation: Airtightness Assumptions

A “no fail” option is available.

Most projects tend to assume 4.5 to 5.5 ACH50.

- Step 1 is the “training wheels”

The Township “strongly encourages” but does not require a mid-construction blower door test.

- Incentive program is available

TOL Step Code - Non-Compliance

Prevention:

- Make conservative design assumptions
- Take advantage of air tightness training and resources
- Conduct a mid-construction blower door test

TOL Step Code - Non-Compliance

Options after a test that fails:

- Should the blower door test be re-done?
  - Weather conditions
  - Equipment calibration
- Check the volume calculation
- Can the air barrier be repaired?
- Can compliance be demonstrated using 9.36.5 / ASTM E-779?
  - Involves a registered professional
- Can the building design be modified to achieve the target?

TOL Step Code - Non-Compliance

If the building cannot achieve compliance using the Step Code:

- Loss of performance bond
- Involvement of registered professionals
  - Identify cause of failure
  - Identify alternative energy code compliance options (e.g. 9.36.2 to 9.36.4 prescriptive, 9.36.5 modelling, etc.)
- Airtightness training is recommended, but not required by the Township of Langley

Township of Langley

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THANK YOU!

BUILDER FORUM SERIES

AIRTIGHTNESS

Township of Langley
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ENERGY STEPCODE
BUILDING BEYOND THE STANDARD

Step Code in Surrey

- Surrey's Requirements
- From Application to Occupancy
- Key Resources and Supports

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Maxwell Sykes
Climate and Energy Manager
Apr 25, 2019

Surrey's Requirements

	Surrey Building Bylaw	
	Apr 1, 2019	Jan 1, 2021
Single-Family and Duplex	Step 1	Step 3
Townhouses and Small MURBs	Step 1	Step 3
MURBs and Hotels/Motels	Step 3, or Step 2 with *Low-Carbon Energy System Pathway*	
Commercial Office	Step 2	
Retail and Mercantile	Step 2	

EA = Energy Advisor
RP = Registered Professional

Can Complete Forms	Required for Occupancy
EA or RP	 SFDs now others soon
RP (can work with EA)	

ENERGY STAR® Portfolio Manager® for eligible buildings

Surrey's Requirements

	Surrey Building Bylaw	
	Apr 1, 2019	Jan 1, 2021
Single-Family and Duplex	Step 1	Step 3
Townhouses and Small MURBs	Step 1	Step 3
MURBs and Hotels/Motels	Step 3, or Step 2 with *Low-Carbon Energy System Pathway*	
Commercial Office	Step 2	
Retail and Mercantile	Step 2	

- ❑ Require Mid-Construction Airtightness Test to pass Insulation Inspection
- ❑ 21 months at BCBC-equivalent
- ❑ Access airtightness resources, including Small Planet Course
- ❑ Learn from Guides and Building Pathfinder

SFDs now
others soon

ENERGY STAR® PortfolioManager®
for eligible buildings

Surrey's Requirements

	Surrey Building Bylaw	
	Apr 1, 2019	Jan 1, 2021
Single-Family and Duplex	Step 1	Step 3
Townhouses and Small MURBs	Step 1	Step 3
MURBs and Hotels/Motels	Step 3, or Step 2 with *Low-Carbon Energy System Pathway*	
Commercial Office	Step 2	
Retail and Mercantile	Step 2	

SFDs now
others soon

- ❑ Account for Step during DP
- ❑ Learn from Guides and Building Pathfinder
- ❑ Comply with lower Step using LCES Pathway
  - ✓ Eligible system type
  - ✓ GHGI ≤ 6kgCO_2e/m^2a
  - ✓ Part of DP application

ENERGY STAR® PortfolioManager®
for eligible buildings

Surrey's Requirements: Details in Bulletins

Links to Surrey Bulletins at www.surrey.ca/stepcode

Residential Building Permits

Read the BCBC 2018 Bulletin regarding the upcoming changes to the Building Code. Please also review the Part 9 Energy Step Code Bulletin regarding the upcoming implementation of the BC Energy Step Code requirements.

Commercial Building Permits

The British Columbia Energy Step Code for applicable Part 3 and Part 9 buildings is effective from April 1, 2019.

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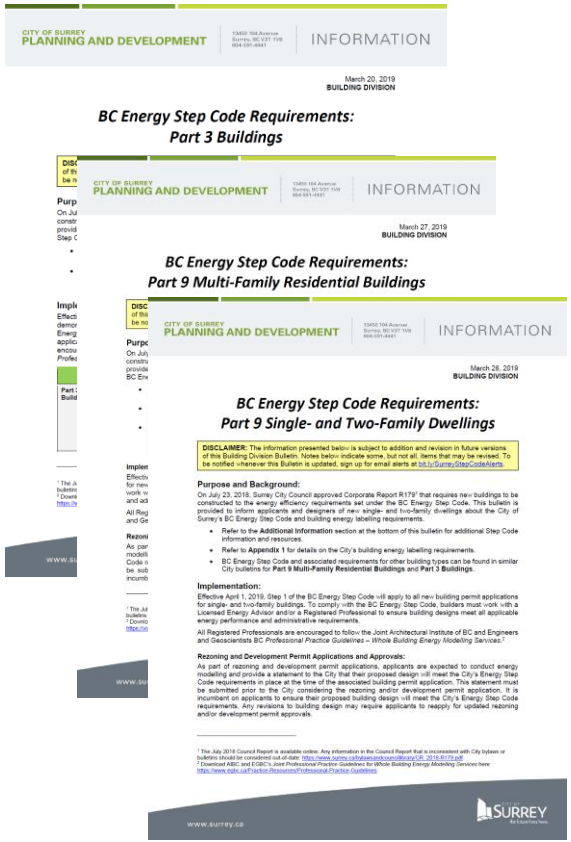
Subscribe to Step Code Alerts


CITY OF SURREY
PLANNING AND DEVELOPMENT
INFORMATION

March 20, 2019
BUILDING DIVISION

BC Energy Step Code Requirements: Part 3 Buildings

March 27, 2019
BUILDING DIVISION

BC Energy Step Code Requirements: Part 9 Multi-Family Residential Buildings

March 28, 2019
BUILDING DIVISION

BC Energy Step Code Requirements: Part 9 Single- and Two-Family Dwellings

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Purpose and Background:

On July 23, 2018, Surrey City Council approved Corporate Report R179[1] that requires new buildings to be constructed to the energy efficiency requirements set under the BC Energy Step Code. This bulletin is provided to inform applicants and designers of new single- and two-family dwellings about the City of Surrey's BC Energy Step Code and building energy labeling requirements.

- Refer to the **Additional Information** section at the bottom of this bulletin for additional Step Code information and resources.
- Refer to **Appendix 1** for details on the City's building energy labeling requirements.
- BC Energy Step Code and associated requirements for other building types can be found in similar City bulletins for **Part 9 Multi-Family Residential Buildings** and **Part 3 Buildings**.

Implementation:

Effective April 1, 2019, Step 1 of the BC Energy Step Code will apply to all new building permit applications for single- and two-family buildings. To comply with the BC Energy Step Code, builders must work with a Licensed Energy Advisor and/or a Registered Professional to ensure building designs meet all applicable energy performance and administrative requirements.

All Registered Professionals are encouraged to follow the Joint Architectural Institute of BC and Engineers and Geoscientists BC *Professional Practice Guidelines – Whole Building Energy Modeling Services*[2]

Rezoning and Development Permit Applications and Approvals:

As part of rezoning and development permit applications, applicants are expected to conduct energy modelling and provide a statement to the City that their proposed design will meet the City's Energy Step Code requirements in place at the time of the associated building permit application. This statement must be submitted prior to the City considering the rezoning and/or development permit application. It is incumbent on applicants to ensure their proposed building design will meet the City's Energy Step Code requirements. Any revisions to building design may require applicants to reapply for updated rezoning and/or development permit approvals.

[1] The July 2018 Council Report is available online. Any information in the Council Report that is inconsistent with City bylaws or bulletins should be considered out-of-date: https://www.surrey.ca/bylawsandcouncillibrary/CR_2018-R179.pdf

[2] Download AIBC and EGBC's *Joint Professional Practice Guidelines for Whole Building Energy Modelling Services* here: https://www.egbc.ca/Practice-Resources/Professional-Practice-Guidelines

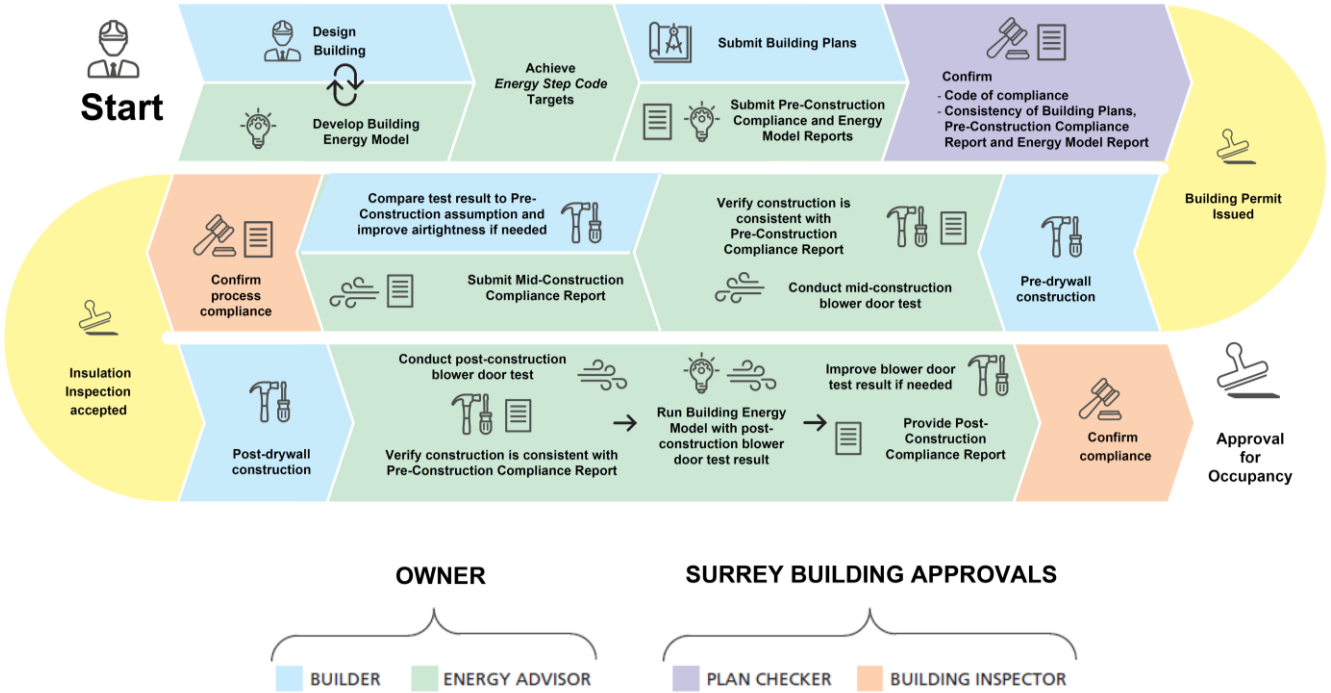
www.surrey.ca

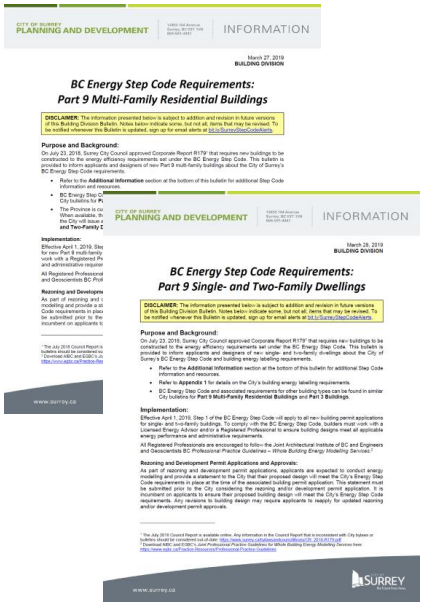
SURREY

BC Building Code Bulletins:
https://energystepcode.ca/

From Application to Occupancy: Part 9 Residential

Find detailed slides from April 2 Builder Breakfast at surrey.ca/stepcode




CITY OF SURREY PLANNING AND DEVELOPMENT INFORMATION

March 27, 2019
BUILDING DIVISION

BC Energy Step Code Requirements: Part 9 Multi-Family Residential Buildings

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Purpose and Background:

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- Refer to the **Additional Information** section at the bottom of this bulletin for additional Step Code information and resources.
- BC Energy Step Code and associated requirements for other building types can be found in similar City bulletins for **Part 9 Multi-Family Residential Buildings** and **Part 3 Buildings**.

Implementation:

Effective April 1, 2019, Step 1 of the BC Energy Step Code will apply to all new building permit applications for single- and two-family buildings. To comply with the BC Energy Step Code, builders must work with a Registered Professional (e.g. energy advisor, mechanical engineer, architect) to ensure building designs meet all applicable energy performance and administrative requirements.

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† Download ABC and EGBC's Joint Professional Practice Guidelines for Whole Building Energy Modelling Services here: https://www.egbc.ca/Practice-Resources/Professional-Practice-Guidelines

www.surrey.ca

CITY OF SURREY PLANNING AND DEVELOPMENT INFORMATION

March 28, 2019
BUILDING DIVISION

BC Energy Step Code Requirements: Part 9 Single- and Two-Family Dwellings

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† Download ABC and EGBC's Joint Professional Practice Guidelines for Whole Building Energy Modelling Services here: https://www.egbc.ca/Practice-Resources/Professional-Practice-Guidelines

www.surrey.ca

From Application to Occupancy: Airtightness Testing

Mid-Construction Airtightness Test Requirement

Part 9 buildings must complete a mid-construction airtightness test **before** booking Insulation Inspection

Passing the Post-Construction Airtightness Test

Buildings with a post-construction blower door test value **resulting in non-compliance** will need to mitigate and re-test to become compliant and pass Final Inspection

CITY OF SURREY the future lives here. BC Hydro

$400 Rebate

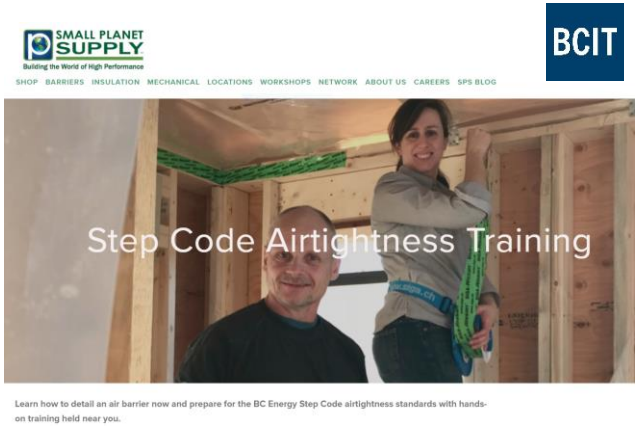
for Mid-Construction Airtightness Test

- Limited number
- Must have passed Sheathing Inspection
- To apply, contact stepcode@surrey.ca

Step Code Airtightness Training Course

As you sign out today, tell us if you are interested in:

1. taking the course
2. the Punjabi-language version



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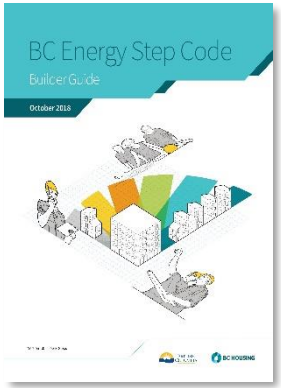
Resources and Supports

https://energystepcode.ca/all-resources/

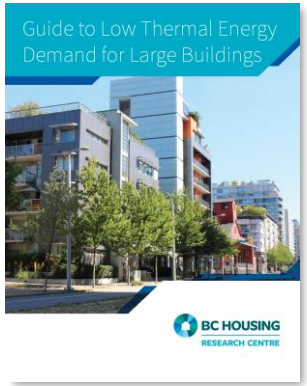


Builder Guide

Key strategies builders can use for houses and low-rise (Part 3 and Part 9) wood-frame residential buildings

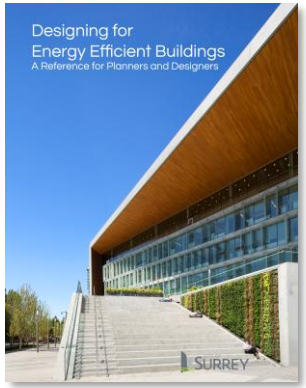
Design Guide

Key strategies to for mid- and high-rise (Part 3) wood-frame and non-combustible residential buildings



Low Thermal Demand Guide

How large buildings can meet Passive House and other high levels of performance



Surrey's Designing for Energy Efficient Buildings

For Planners and Designers, mostly Part 3

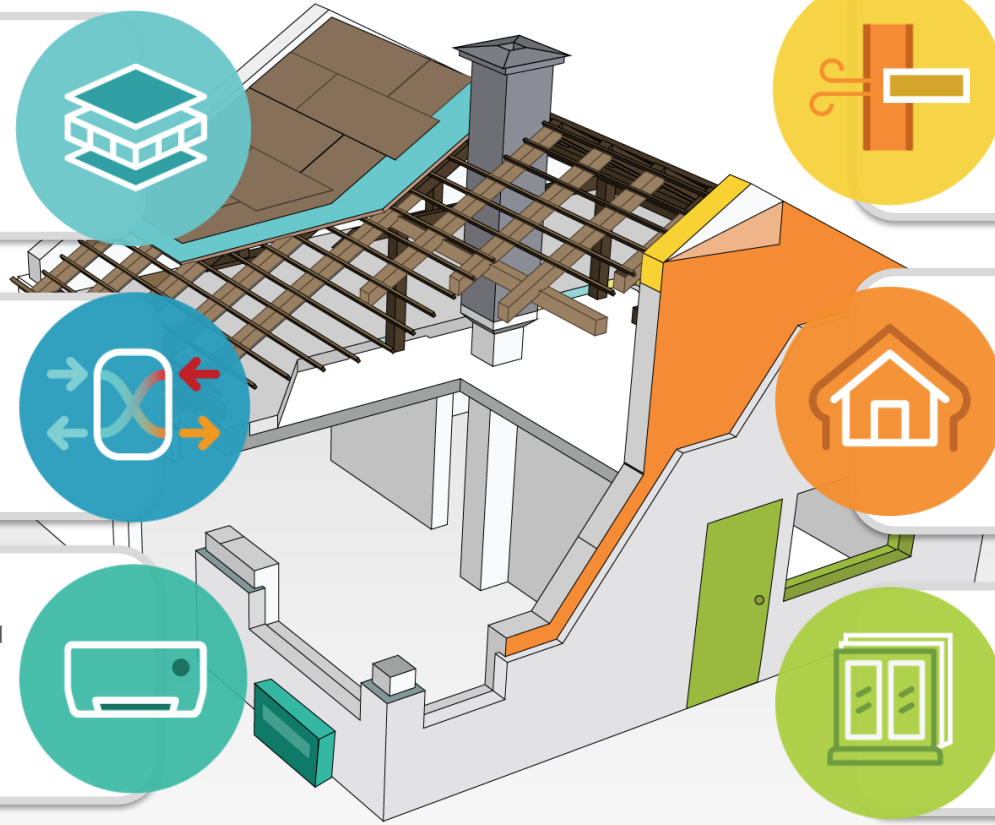
Resources and Supports

The Six Strategies that cost-effectively boost performance

1. BOOST INSULATION
To reduce heat loss, increase insulation in walls, floors, roof, and foundation.

2. VENTILATE SMARTLY
Bring plenty of fresh air into the home and recover heat from the exhaust air leaving the building.

3. MIND YOUR MACHINES
Specify efficient appliances, and ensure your heating system will meet – but not exceed – the home's needs.

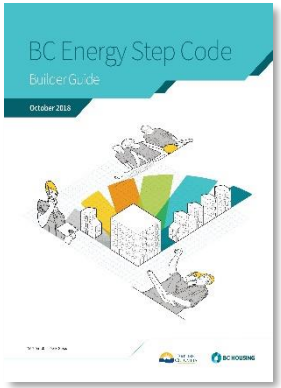


4. BAN BRIDGES
A break in your insulation acts like a bridge that carries heat straight out of the house. Take care with corners, junctions, gaps and studs!

5. SEAL IT UP
Air leaks are heat leaks. Wrap the home tightly, taking care to seal around ducts, pipes, fixtures, and wires that pass through walls, ceilings, and roof.

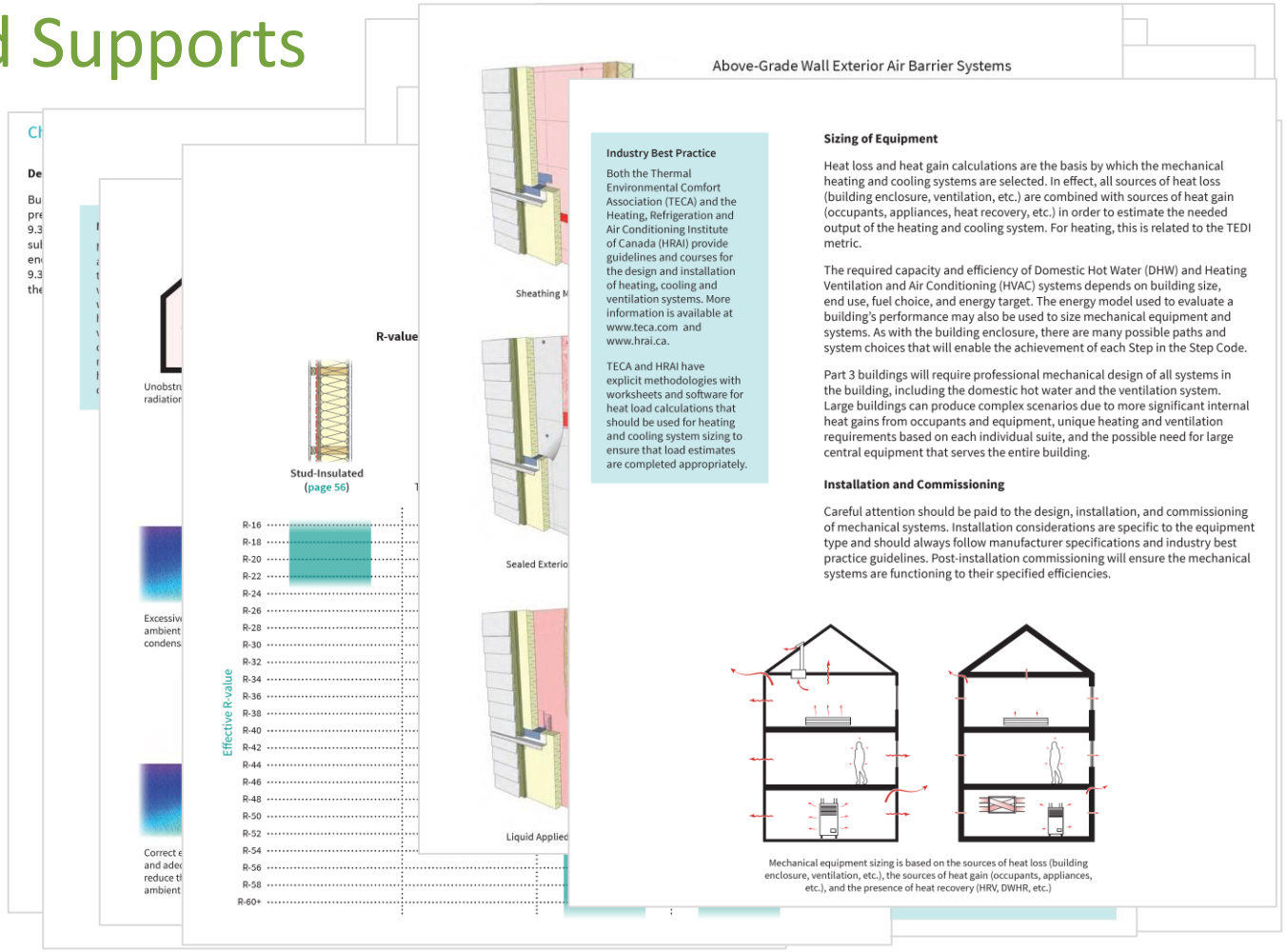
6. THINK ABOUT DOORS & WINDOWS
Carefully consider their energy performance, size, and location.

Resources and Supports



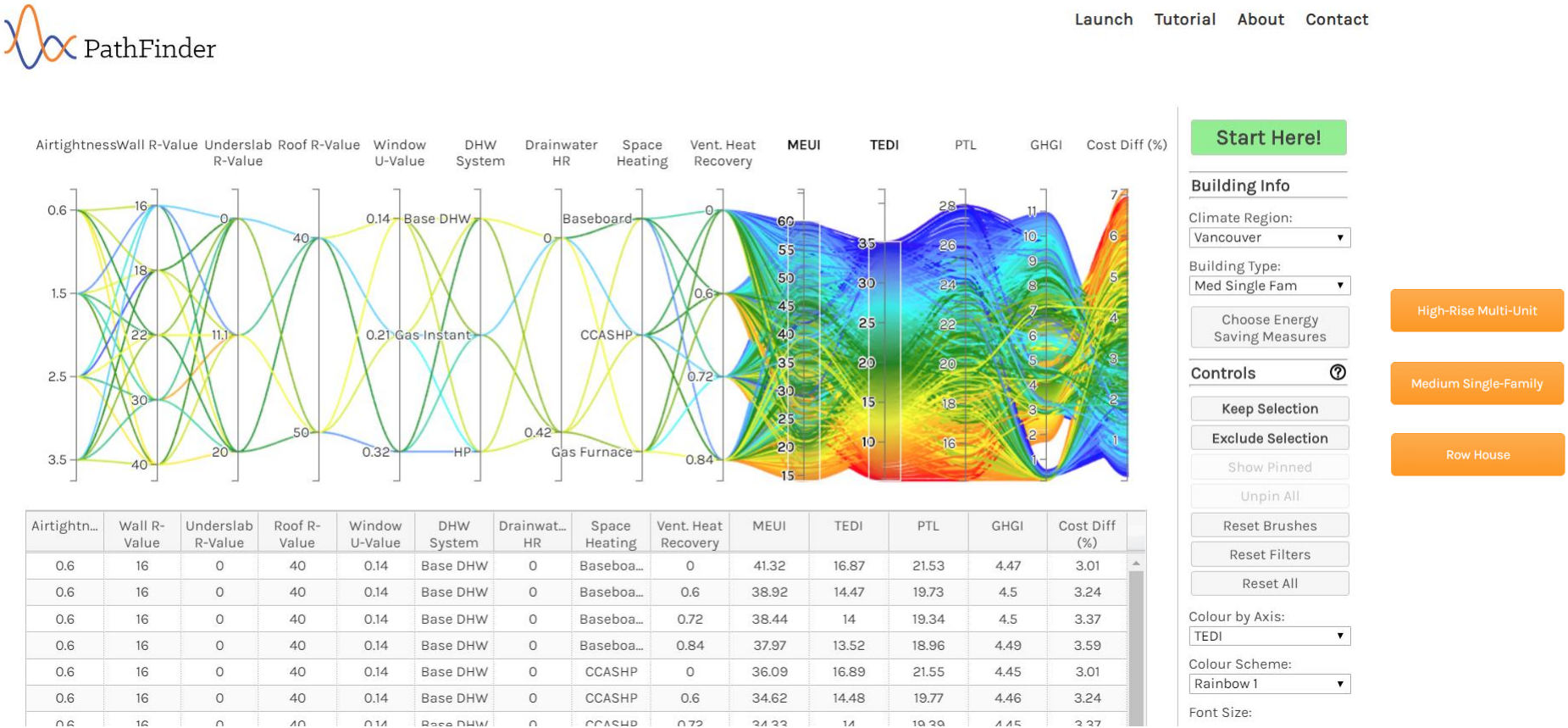
Builder Guide

Key strategies builders can use for houses and low-rise (Part 9 and Part 3) wood-frame residential buildings



Resources and Supports

http://www.buildingpathfinder.com



Airtightn...	Wall R-Value	Underslab R-Value	Roof R-Value	Window U-Value	DHW System	Drainwat... HR	Space Heating	Vent. Heat Recovery	MEUI	TEDI	PTL	GHGI	Cost Diff (%)
0.6	16	0	40	0.14	Base DHW	0	Baseboa...	0	41.32	16.87	21.53	4.47	3.01
0.6	16	0	40	0.14	Base DHW	0	Baseboa...	0.6	38.92	14.47	19.73	4.5	3.24
0.6	16	0	40	0.14	Base DHW	0	Baseboa...	0.72	38.44	14	19.34	4.5	3.37
0.6	16	0	40	0.14	Base DHW	0	Baseboa...	0.84	37.97	13.52	18.96	4.49	3.59
0.6	16	0	40	0.14	Base DHW	0	CCASHP	0	36.09	16.89	21.55	4.45	3.01
0.6	16	0	40	0.14	Base DHW	0	CCASHP	0.6	34.62	14.48	19.77	4.46	3.24
0.6	16	0	40	0.14	Base DHW	0	CCASHP	0.72	34.33	14	19.39	4.45	3.37

ENERGY STEPCODE
BUILDING BEYOND THE STANDARD

Step Code in Surrey

- Surrey's Requirements
- From Application to Occupancy
- Key Resources and Supports

CITY OF SURREY
the future lives here.

Maxwell Sykes
Climate and Energy Manager
Apr 25, 2019

BUILDER FORUM SERIES

AIRTIGHTNESS

Township of Langley
Est. 1873

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the future lives here.

Township of Langley BC
Est. 1873

Builder Breakfast
Energy Step Code in the City of Surrey and the Township of Langley

ODESSA

A Builders Point Of View
On Next Level Efficient Building

ODESSA

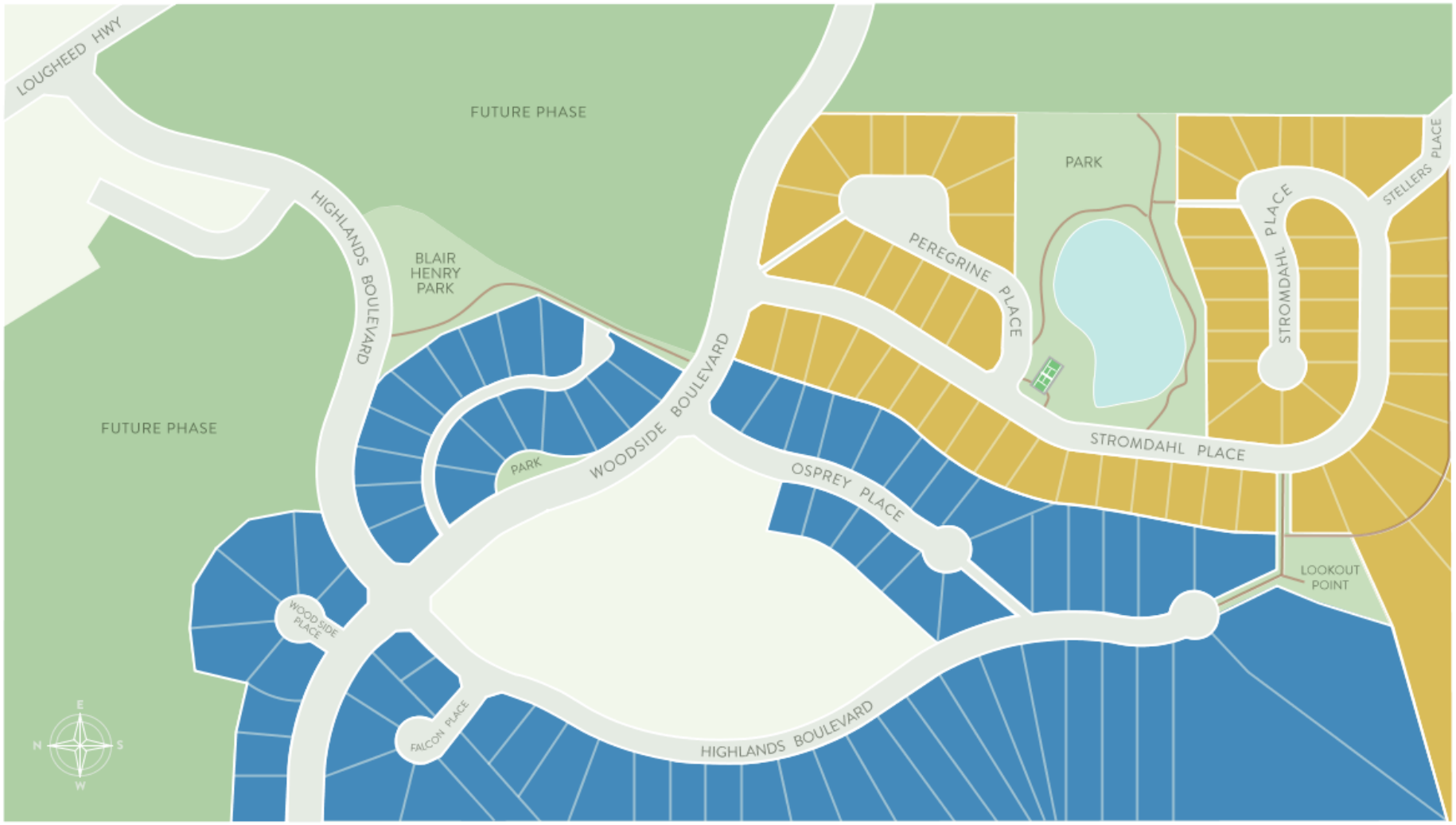
ODESSA

ODESSA

HARRISON HIGHLANDS

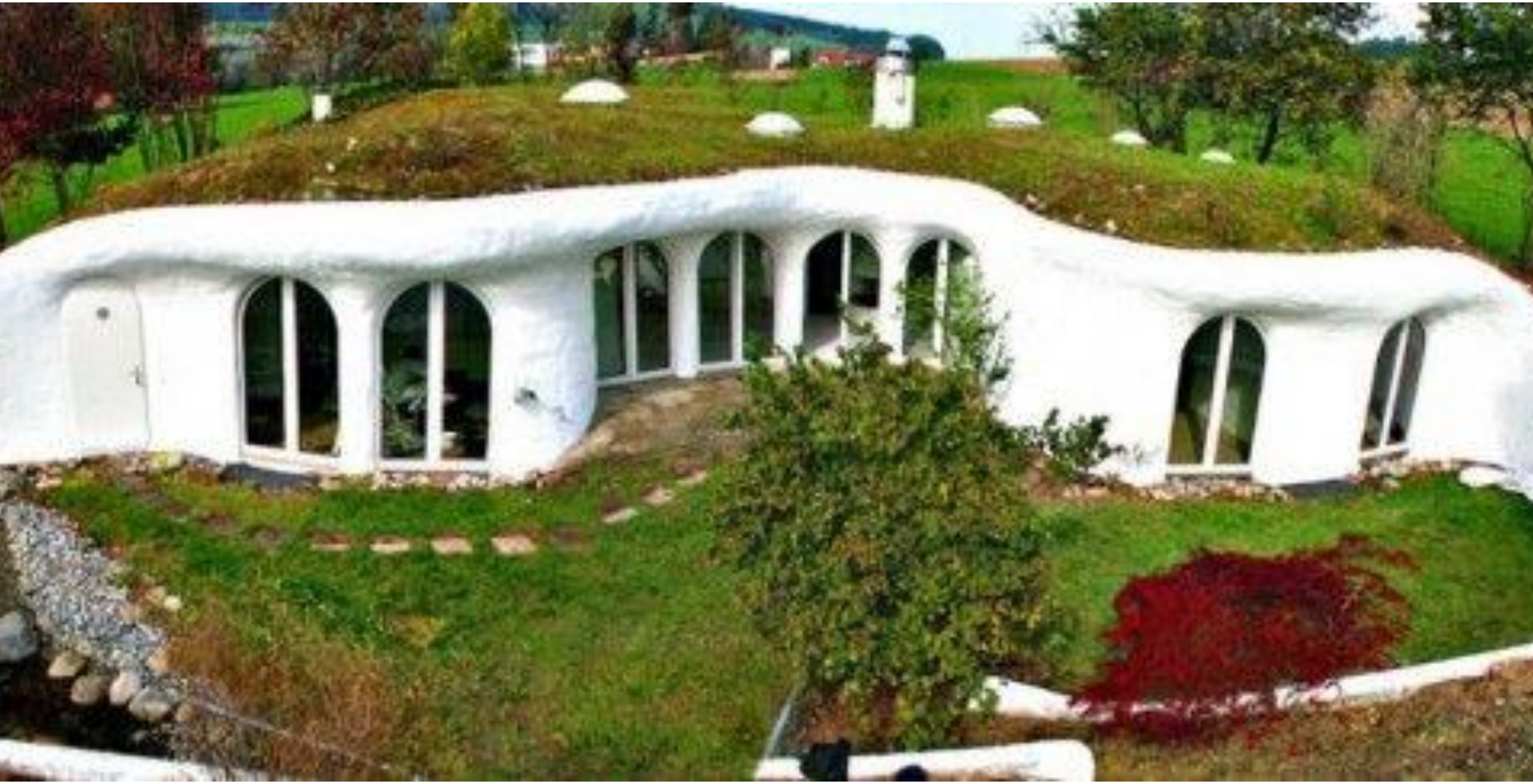
PHASE 1 SOLD OUT

PHASE 2



Green EXTREME !

ODESSA

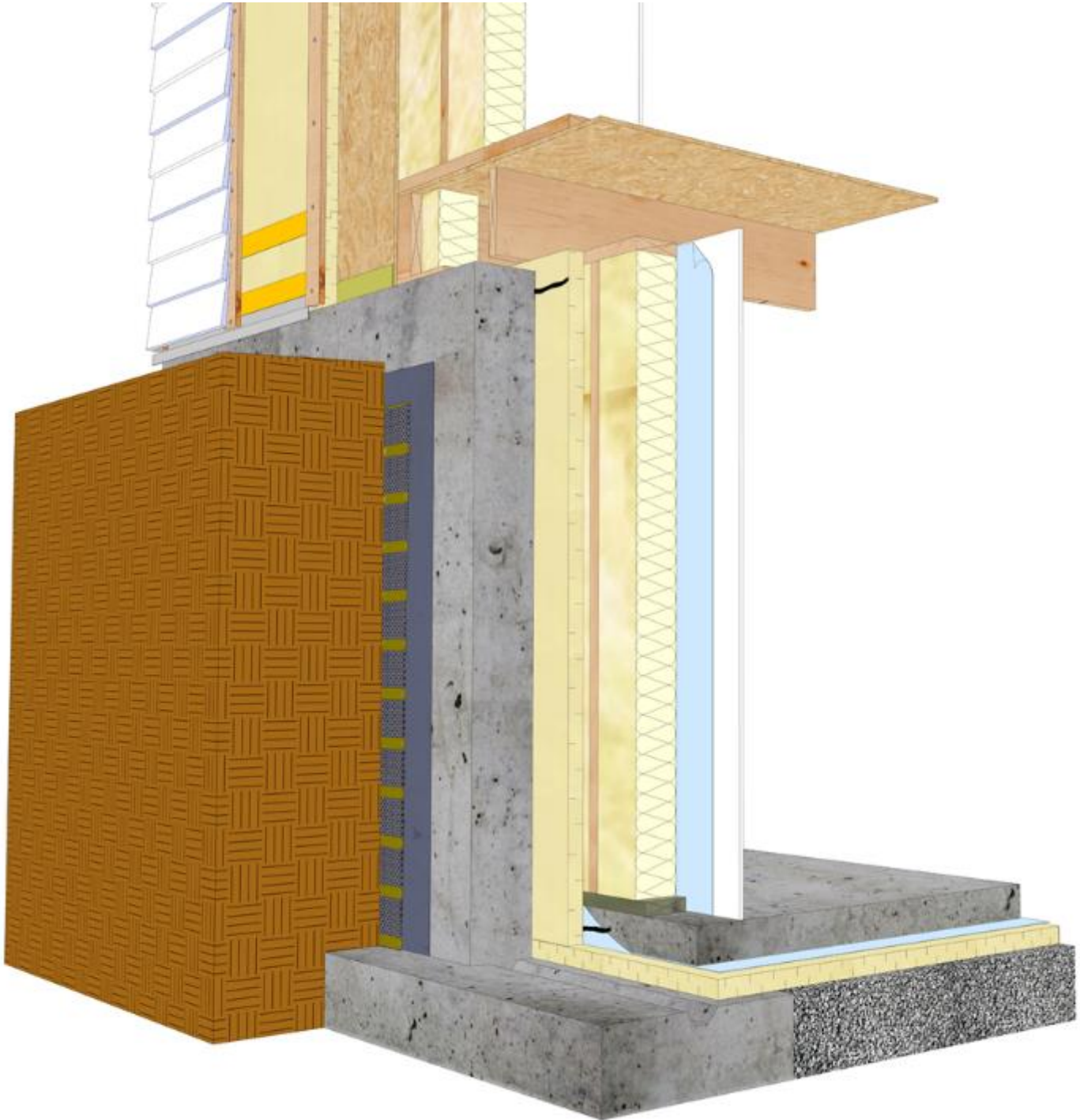


Building Energy Efficient

What does it take?

ODESSA


STYROFOAM™
MISE EN GARDE
CAUTION




www.a1doors.ca
A-1 Doors
& MOULDINGS
591-1044
www.a1doors.ca

Why Build
More Energy Efficient ?

- Value for Home Buyers

ODESSA

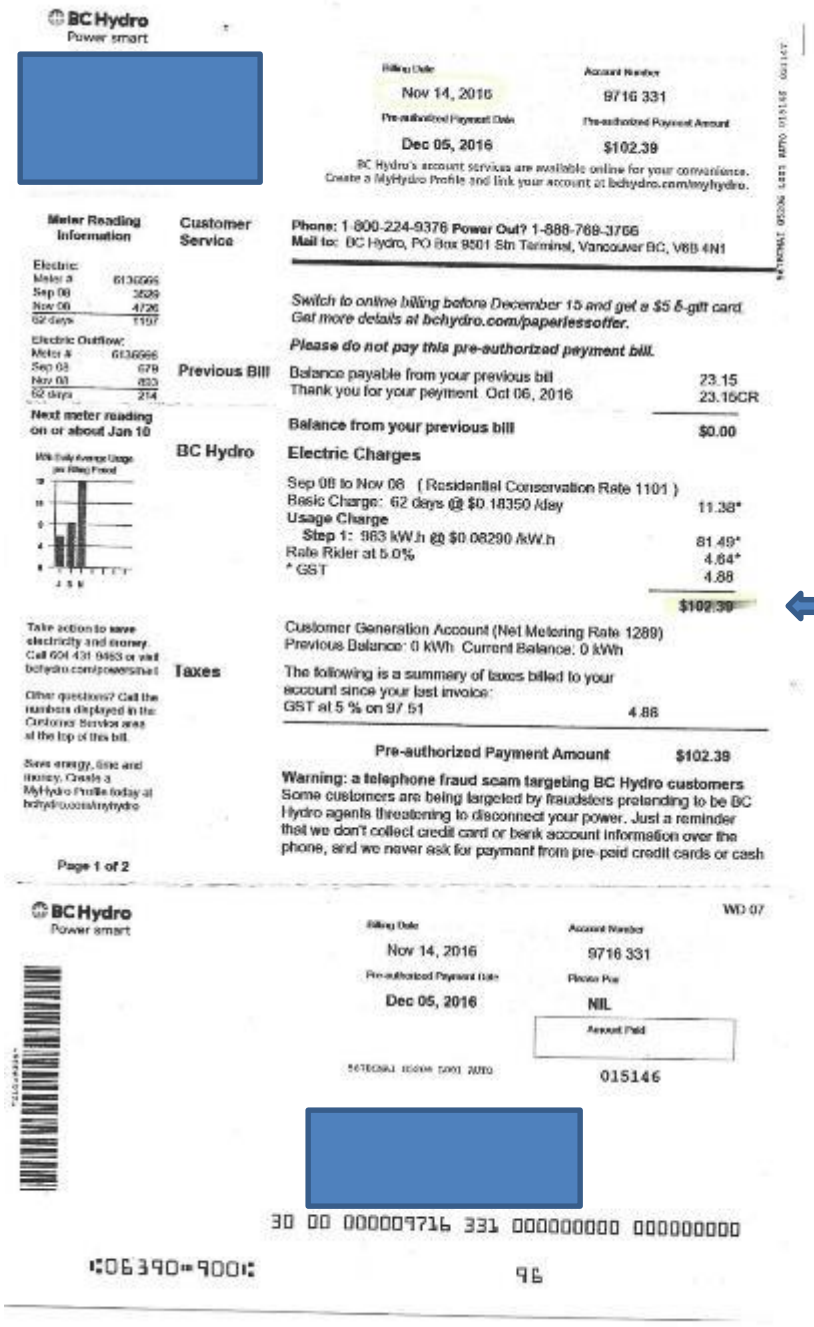
- Value for Home Buyers
- Market Differential

ODESSA

- Value for Home Buyers
- Market Differential
- Preparing for the Future

ODESSA

SEPT 8 – NOV 8 = 62 DAYS



BC Hydro
Power smart

[redacted]

Billing Date: Nov 14, 2016
Account Number: 9716 331
Pre-authorized Payment Date: Dec 05, 2016
Pre-authorized Payment Amount: $102.39

BC Hydro's account services are available online for your convenience. Create a MyHydro Profile and link your account at bchydro.com/myhydro.

Meter Reading Information

Electric:
Meter # 6136666
Sep 08 3529
Nov 08 4726
62 days 1197

Electric Outflow:
Meter # 6136666
Sep 08 679
Nov 08 893
62 days 214

Next meter reading on or about Jan 10

With Daily Average Usage per Billing Period

Take action to save electricity and money. Call 604 431 9463 or visit bchydro.com/powersmart

Other questions? Call the numbers displayed in the Customer Service area at the top of this bill.

Save energy, time and money. Create a MyHydro Profile today at bchydro.com/myhydro

Page 1 of 2

Customer Service

Phone: 1-800-224-9376 Power Out? 1-888-769-3766
Mail to: BC Hydro, PO Box 9501 Stn Terminal, Vancouver BC, V6B 4N1

Switch to online billing before December 15 and get a $5 E-gift card. Get more details at bchydro.com/paperlessoffer.

Please do not pay this pre-authorized payment bill.

Previous Bill

Balance payable from your previous bill	23.15
Thank you for your payment Oct 06, 2016	23.15CR
Balance from your previous bill	**$0.00**

BC Hydro

Electric Charges

Sep 08 to Nov 08 (Residential Conservation Rate 1101)

Basic Charge: 62 days @ $0.18350 /day	11.38*
Usage Charge	
Step 1: 963 kW.h @ $0.08290 /kW.h	81.49*
Rate Rider at 5.0%	4.64*
* GST	4.88
	$102.39

Customer Generation Account (Net Metering Rate 1289)
Previous Balance: 0 kWh Current Balance: 0 kWh

Taxes

The following is a summary of taxes billed to your account since your last invoice:
GST at 5 % on 97.51 4.88

Pre-authorized Payment Amount $102.39

Warning: a telephone fraud scam targeting BC Hydro customers
Some customers are being targeted by fraudsters pretending to be BC Hydro agents threatening to disconnect your power. Just a reminder that we don't collect credit card or bank account information over the phone, and we never ask for payment from pre-paid credit cards or cash

WD 07

BC Hydro
Power smart

Billing Date: Nov 14, 2016
Account Number: 9716 331
Pre-authorized Payment Date: Dec 05, 2016
Please Pay: NIL
Amount Paid
015146

[redacted]

30 00 000009716 331 000000000 000000000

:06390=900:

96

← **$102.39**

Next Steps For Us

ODESSA

Questions

nathan@odessagroup.ca

BUILDER FORUM SERIES

AIRTIGHTNESS

Township of Langley

Est. 1873

CITY OF SURREY

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CONSTRUCTION INC

Building Step Code

Presented By Larry Clay
Clay Construction Inc.

CLAY
CONSTRUCTION INC

Luxury Custom Homes

CLAY CONSTRUCTION INC

High Performance Homes

CLAY CONSTRUCTION INC

Certifications

R-2000*

CLAY CONSTRUCTION INC

A High Performance Home

- Efficient
- Durable
- Quiet
- Comfortable
- Healthy

"… Save Money"

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Gord Cooke

CLAY CONSTRUCTION INC

Basements Can Feel…

CLAY CONSTRUCTION INC

Proper Ventilation

CLAY CONSTRUCTION INC

High Performance Windows

CLAY CONSTRUCTION INC

A High Performance Home

- Healthy

"… Live Healthy"

- Comfortable
- Quiet
- Durable
- Efficient

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Healthy Dry Basement

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Finished Basement

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Home Modelled To Step Code

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Step Code: Insulation – Above Grade

Insulation Above Grade (Interior)						
Upgrade	**Current Code Built**	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
R20 Batt	$0					
R22 Batts		$500	$500			
R24 Batts				$1,000	$1,000	$1,000
Total	**$0**	**$500**	**$500**	**$1,000**	**$1,000**	**$1,000**

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Step Code: Insulation – Below Grade

Insulation Below Grade						
Upgrade	**Current Code Built**	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
R14 Batt	$0					
R4 XPS	$0	$3000	$3000	$3,000	$3,000	
R15 XPS	$0			$1,000	$1,000	$5,400
Total	**$0**	**$3000**	**$3000**	**$3,000**	**$3,000**	**$5,400**

Step Code: Insulation – Miscellaneous

Insulation Miscellaneous						
Upgrade	**Current Code Built**	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
R12 Under Slab	$0			$1,400	$1,400	$1,400
R15 Exterior Rigid						$12,400
R40 Attic	$0	$0	$0	$0	$0	$0
Total	**$0**	**$0**	**$0**	**$1,400**	**$1,400**	**$13,400**

Step Code: Air Tightness

Air Tightness						
Upgrade	**Current Code Built**	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
ACH Report		$0				
ACH 3.0			$500			
ACH 2.5				$1,000		
ACH 1.5					$2,500	
ACH 1.0						$4,000
Total	**$0**	**$500**	**$500**	**$1,000**	**$2,500**	**$4,000**

Step Code: Mechanical

Mechanical						
Upgrade	**Current Code Built**	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
Furnace 92% AFUE	$0	$0	$0			
Furnace 97% AFUE	$0	$0	$0	$1,551	$1,551	$1,551
60” Drain water heat Recovery				$1,500	$1,500	$1,500
Heat Pump					$8,281	$8,281
75% HRV						$5,880
Total	**$0**	**$0**	**$0**	**$3,051**	**$11,332**	**$17,212**

Step Code: Insulation – Windows

Windows						
Upgrade	**Current Code Built**	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
USI 1.8 SHGC 0.25	**$0**	**$0**	**$0**			
USI 1.4 SHGC 0.25				**$3,867**	**$3,867**	**$3,000**
USI 1.4 SHGC 0.5	**$0**	**$0**	**$0**	**$0**	**$0**	**$7,208**
10% Openable	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Total	**$0**	**$0**	**$0**	**$3,867**	**$3,867**	**$7,208**

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Step Code: Total

Upgrade	Current Code Built	Step 1	Step 2	Step 3	Step 4	Step 5
Insulation Above Gr.	$0	$500	$500	$1,000	$1,000	$1,000
Insulation Below Gr.	$0	$3,000	$3,000	$3,000	$3,000	$5,400
Insulation Misc.	$0	$0	$0	$1,400	$1,400	$13,400
Air Tightness	$0	$500	$500	$1,000	$2,500	$4,000
Mechanical	$0	$0	$0	$3,051	$11,332	$17,212
Windows	$0	$0	$0	$3,867	$3,867	$7,208
CEA	$0	$1,600	$2,000	$2,000	$2,000	$2,000
Total	$0	$5,600	$6,000	$15,318	$25,099	$50,220

Culture Change – Energy Advisor

Working with Energy Advisors

- Engage early in design
- Perform mid-construction blower door test

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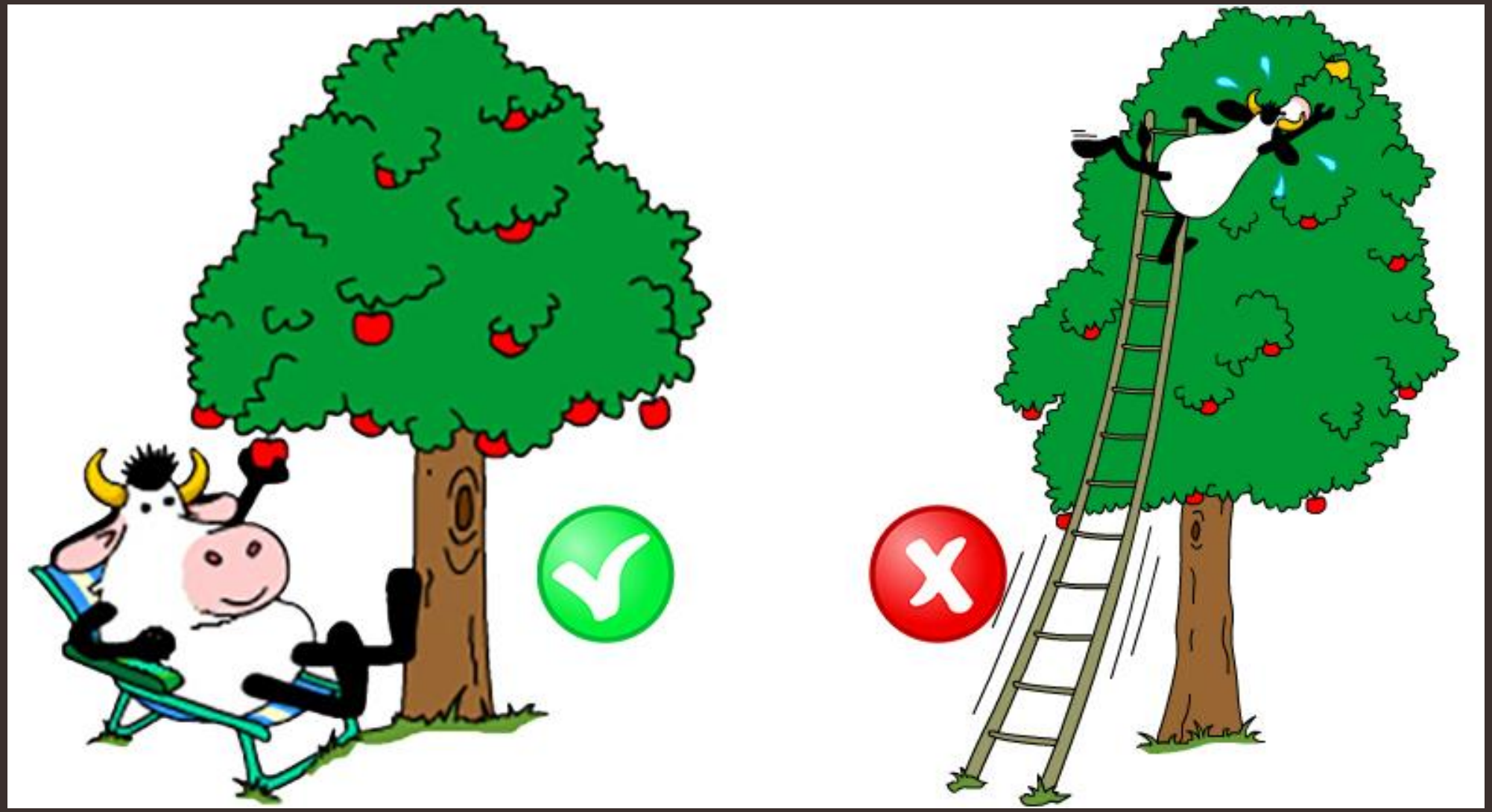
Air Tightness – Low Hanging Fruit



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Condensation

Condensation occurs on cold surfaces!

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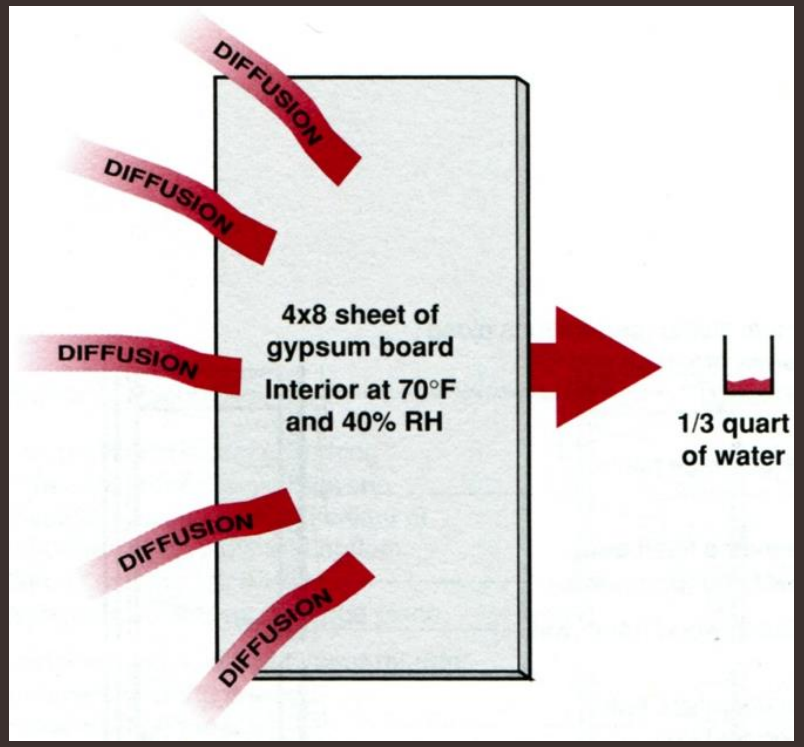
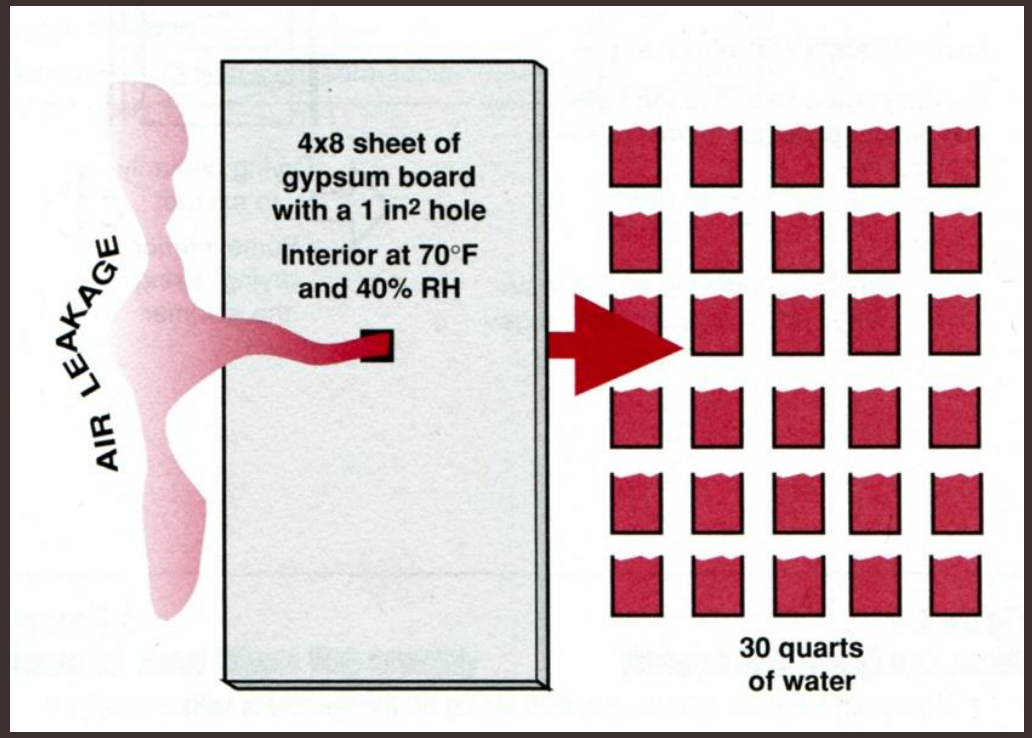
Diffusion vs. Air Transport

Moisture Vapor Diffusion



Moisture Vapor transport due to Air Leakage



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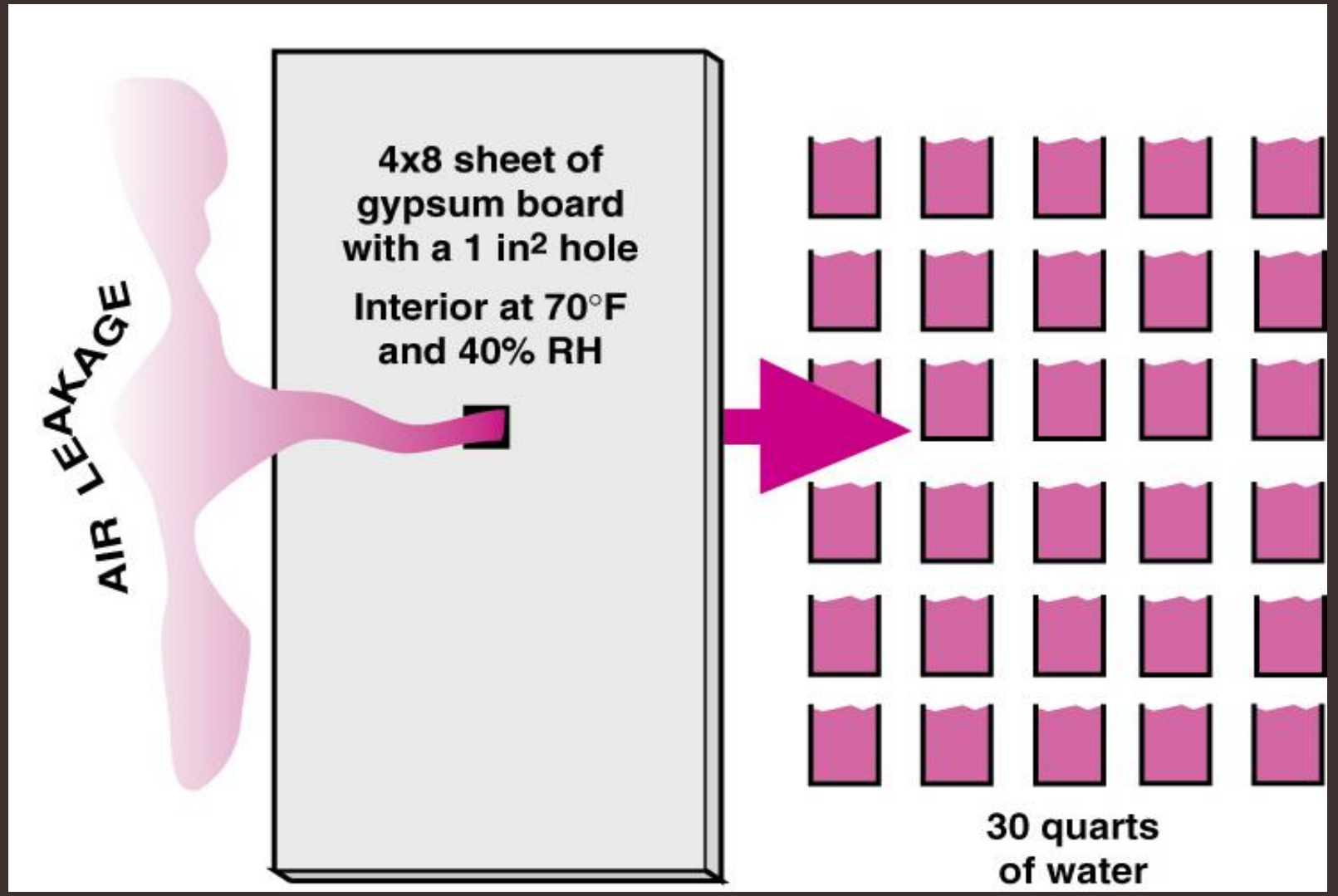
Air Leakage - Condensation

Condensation occurs if air leakage flows **towards** a cold surface



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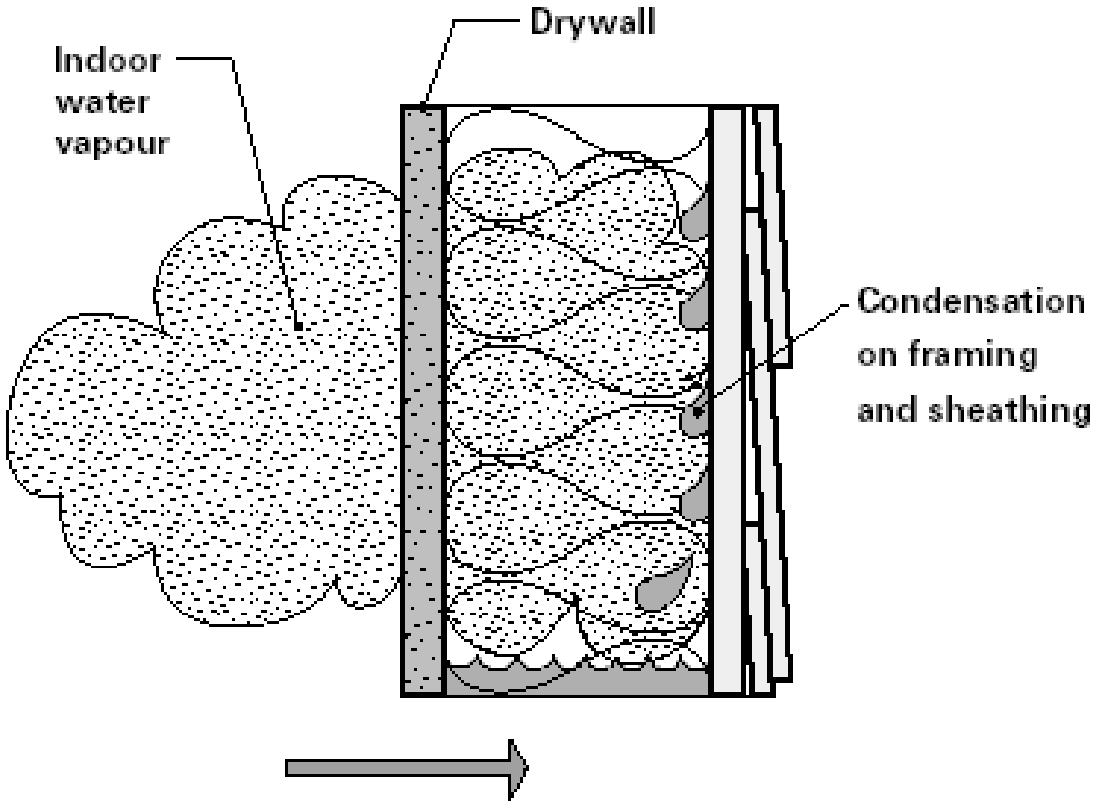
Vapour Transport



Water vapour passes through drywall by diffusion, comes into contact with cold sheathing and condenses

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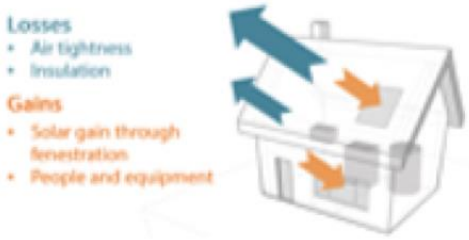
Step Code - 3 Areas of Focus

1. Building Envelope



TEDI
(Thermal Energy Demand Intensity)

2. Equipment & Systems

MEUI
(Mechanical Energy USE Intensity)

TEUI
(Total Energy Use Intensity – Part 3)

3. Airtightness

ACH_{50}
(Air Change per Hour at 50 Pa

L/S_{75}
(Air Leakage Rate at 75 Pa)

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Step Code - Air Tightness

ENERGY STEPCODE
BUILDING BEYOND THE STANDARD

Step	Building Energy Modelling	Airtightness	
		Blower door test	Air changes per hour ACH_{50}
1	✓	✓	report score
2	✓	✓	≤ 3.0
3	✓	✓	≤ 2.5
4	✓	✓	≤ 1.5
5	✓	✓	≤ 1.0

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Blower Door Test – Mid Construction

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Air Barrier

Interior

Exterior

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Taped XPS

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Taped Weather Wrap

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Taped Plywood

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Step Code - Total

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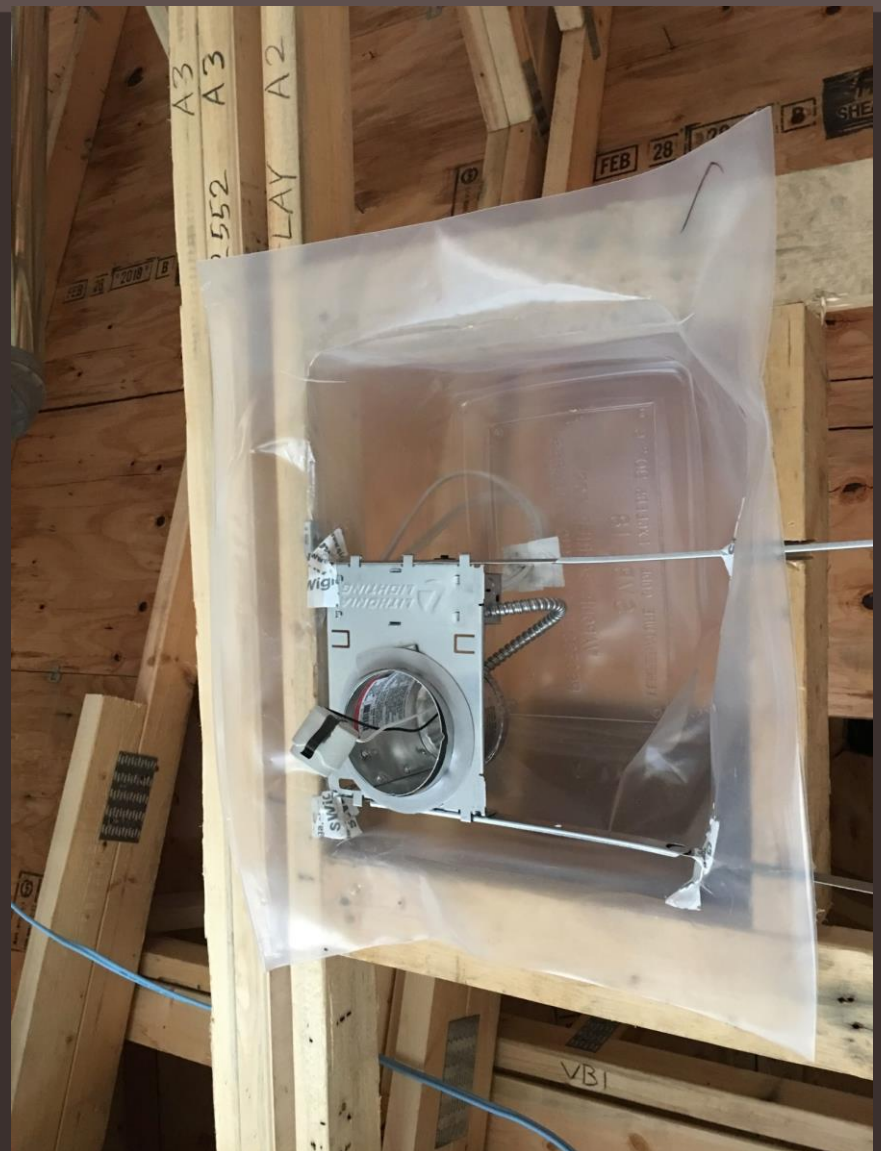
Step Code - Total



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Sealing Penetrations

CLAY CONSTRUCTION INC

Sealing Penetrations

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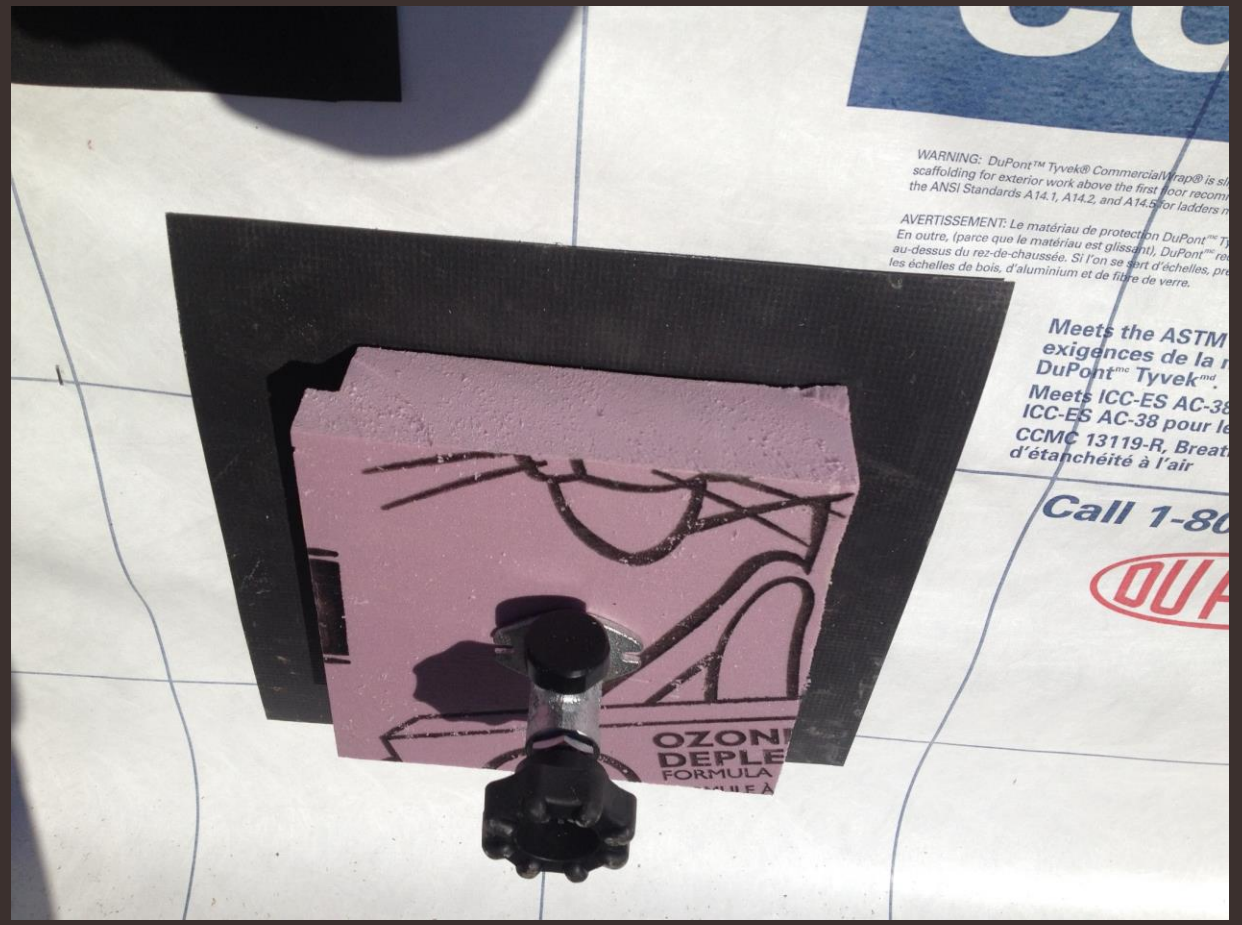
Sealing Penetrations



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Sealing Penetrations

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Exterior Details with ICF

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Exterior Details with ICF

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Exterior Details with ICF

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Exterior Details with ICF

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Exterior Details with ICF

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Exterior Details with ICF

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Step 4 & 5 Advice

Building to the upper steps, engage your Energy Advisor during the design stage.

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Step Code - Total

CLAY CONSTRUCTION INC

Step Code - Total

CLAY CONSTRUCTION INC

Step Code - Total

CLAY CONSTRUCTION INC

Step Code - Total

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3 Key Take Aways

1. Transition to an exterior air barrier
2. Perform a mid-construction blower door test
3. Stop using poly sheeting for vapour barrier…

use paint on vapour barrier or smart vapour barrier

BUILDER FORUM SERIES

AIRTIGHTNESS

Township of Langley

Est. 1873

CITY OF SURREY

the future lives here.

ENERGY STEPCODE
BUILDING BEYOND THE STANDARD

Making Buildings Airtight

April 25th 2019 Surrey Builder Breakfast & Forum

James Bourget, ABET, RRO, CPHT & James Higgins, AScT

RDH Building Science Inc.

Outline

- BC Energy Step Code Airtightness
- Working with an Energy Advisor
- What is an Air Barrier
- House as a System
- Air Barrier Systems, Materials, Accessories, Components
- Details
- Construction and Quality Control
- Examples & Hands-on Training

Step Code Metrics

Airtightness

ACH

Equipment & Systems

% < REF

MEUI

Building Enclosure

TEDI

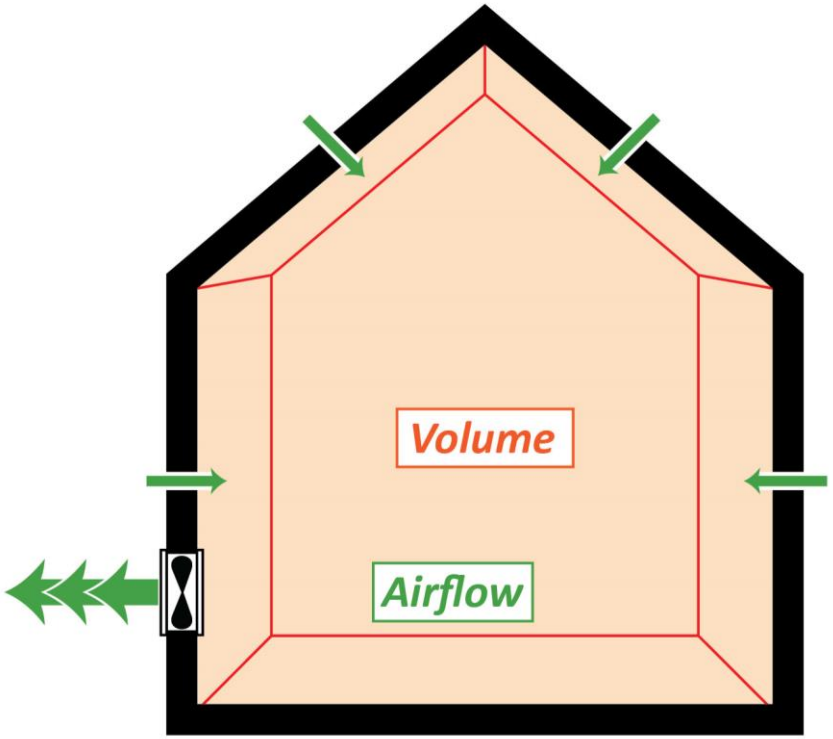
Performance Based

Step Code Metrics

Requirements For Part 9 Buildings Located In Climate Zone 4

	Airtightness	Equipment & Systems			Building Enclosure
	ACH_{50}	% < REF	OR	MEUI* (kWh/(m²·year))	TEDI (kWh/(m²·year))
STEP 1	?	0%			
STEP 2	≤ 3.0	10%	OR	60	35
STEP 3	≤ 2.5	20%	OR	50	30
STEP 4	≤ 1.5	40%	OR	40	20
STEP 5	≤ 1.0			25	15

Airtightness



*Measured as **Air Leakage Rate** in **Air Changes per Hour** (ACH_{50})

Step Code Airtightness

Airtightness

ACH

	Air Leakage Rate
STEP 1	?
STEP 2	≤ 3.0 ACH_{50}
STEP 3	≤ 2.5 ACH_{50}
STEP 4	≤ 1.5 ACH_{50}
STEP 5	≤ 1.0 ACH_{50}

Step Code Airtightness

Airtightness

ACH

Step 1 Part 9 Airtightness

- **Testing is always required**
- Two compliance paths:

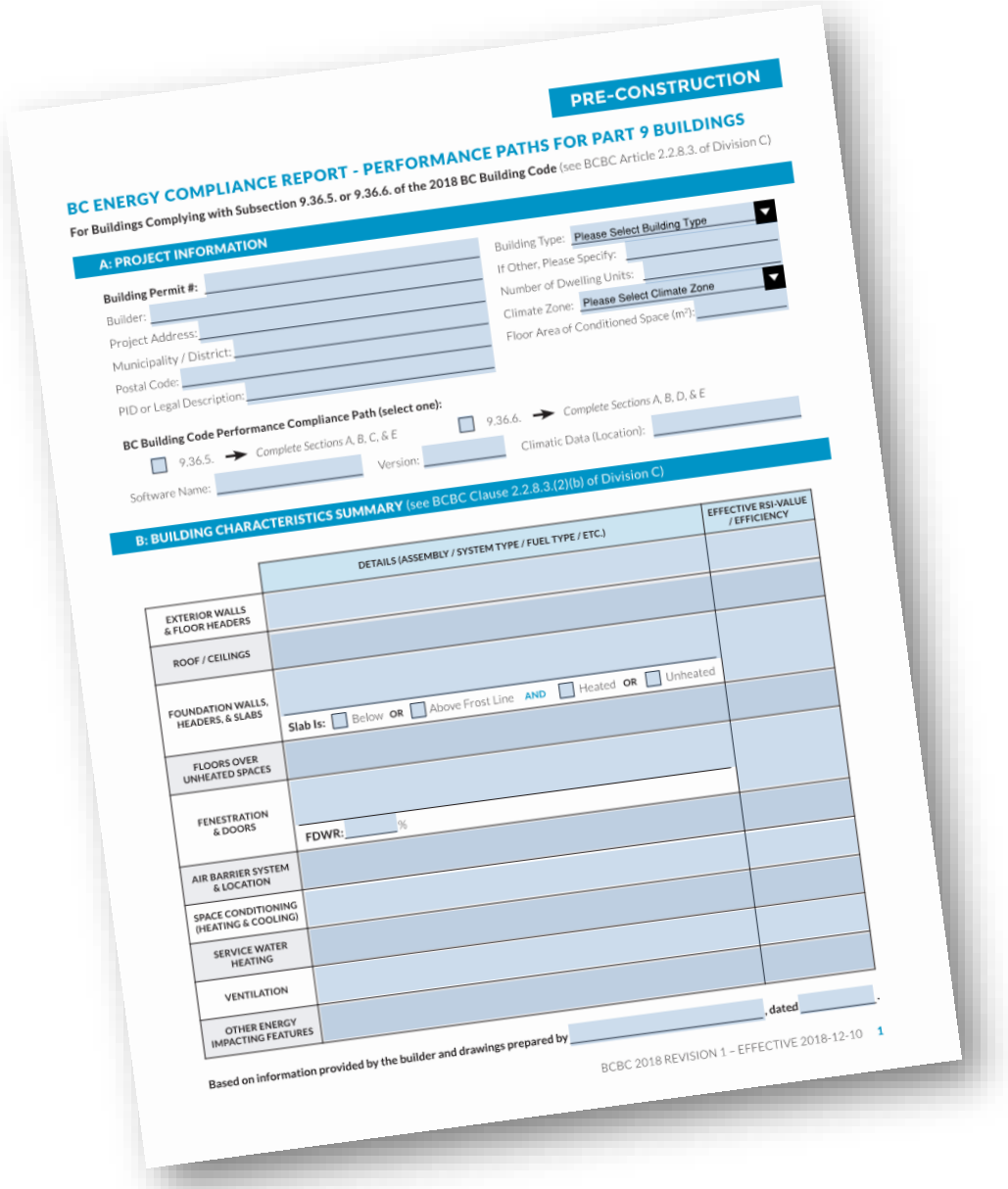
1. The **EnerGuide Rating System** (ERS) reference house uses **2.5 ACH_{50}**. This target must be met, unless other offsetting energy performance improvements are achieved. The ERS building energy model must always include the as-built airtightness.

OR

2. The **9.36.5** reference house also uses **2.5 ACH_{50}** as its baseline reference air leakage rate. **However…**

Step Code Airtightness

- Step Code Compliance Report notes the proposed building airtightness and pathway
- Submitted as part of the BP application, filled out by Energy Advisor
- Pre-Construction & As-Built report required



PRE-CONSTRUCTION

BC ENERGY COMPLIANCE REPORT - PERFORMANCE PATHS FOR PART 9 BUILDINGS

For Buildings Complying with Subsection 9.36.5. or 9.36.6. of the 2018 BC Building Code (see BCBC Article 2.2.8.3. of Division C)

A: PROJECT INFORMATION

Building Permit #:
Builder:
Project Address:
Municipality / District:
Postal Code:
PID or Legal Description:
Building Type: Please Select Building Type
If Other, Please Specify:
Number of Dwelling Units:
Climate Zone: Please Select Climate Zone
Floor Area of Conditioned Space (m²):

BC Building Code Performance Compliance Path (select one):

☐ 9.36.5. → Complete Sections A, B, C, & E
Software Name:
Version:

☐ 9.36.6. → Complete Sections A, B, D, & E
Climatic Data (Location):

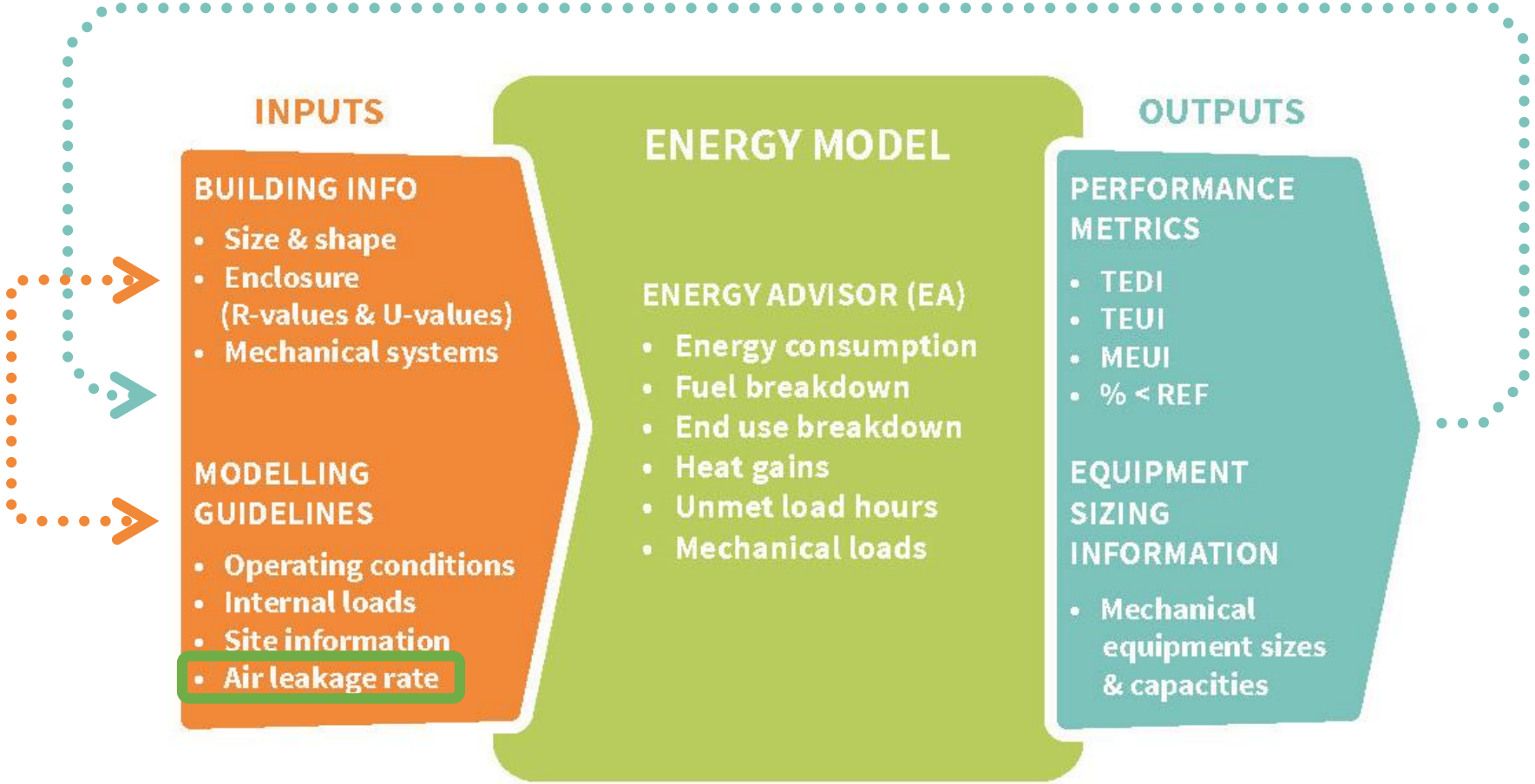
B: BUILDING CHARACTERISTICS SUMMARY (see BCBC Clause 2.2.8.3.(2)(b) of Division C)

	DETAILS (ASSEMBLY / SYSTEM TYPE / FUEL TYPE / ETC.)	EFFECTIVE RSI-VALUE / EFFICIENCY
EXTERIOR WALLS & FLOOR HEADERS		
ROOF / CEILINGS		
FOUNDATION WALLS, HEADERS, & SLABS	Slab Is: ☐ Below OR ☐ Above Frost Line AND ☐ Heated OR ☐ Unheated	
FLOORS OVER UNHEATED SPACES		
FENESTRATION & DOORS	FDWR: ____ %	
AIR BARRIER SYSTEM & LOCATION		
SPACE CONDITIONING (HEATING & COOLING)		
SERVICE WATER HEATING		
VENTILATION		
OTHER ENERGY IMPACTING FEATURES		

Based on information provided by the builder and drawings prepared by _____, dated _____.

BCBC 2018 REVISION 1 – EFFECTIVE 2018-12-10 1

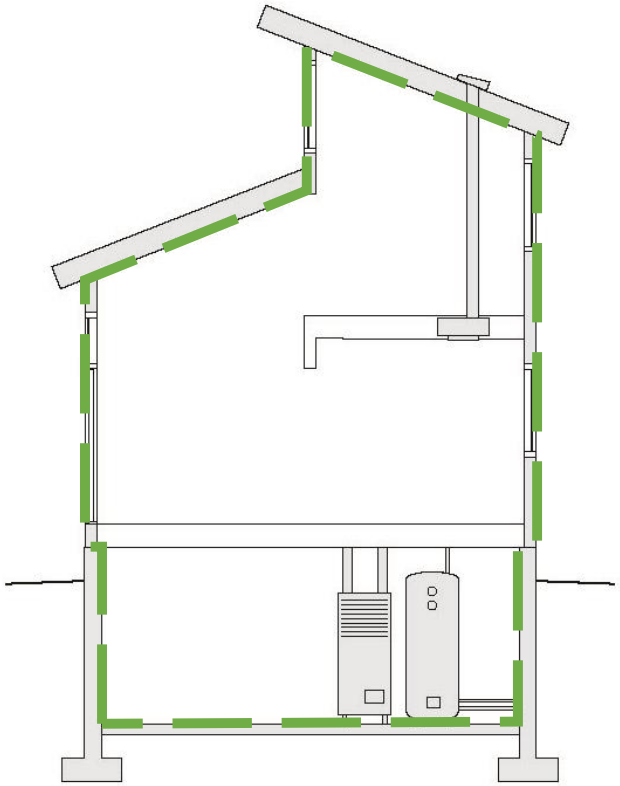
Working with an Energy Advisor



Working with an Energy Advisor

- Get them involved as early as possible
- Ask questions:
  - Experience hitting target airtightness?
  - Good trade-off options?
  - Airtightness testing schedule?
- **Track all design decisions/iterations** to avoid confusion/delay or risk not hitting targets (2.5 or 3.5 or 4.5 ACH?)
- Keep clear list of most up-to-date model inputs
  - R-values/U-values, airtightness, heating/cooling, hot water, window, ventilation

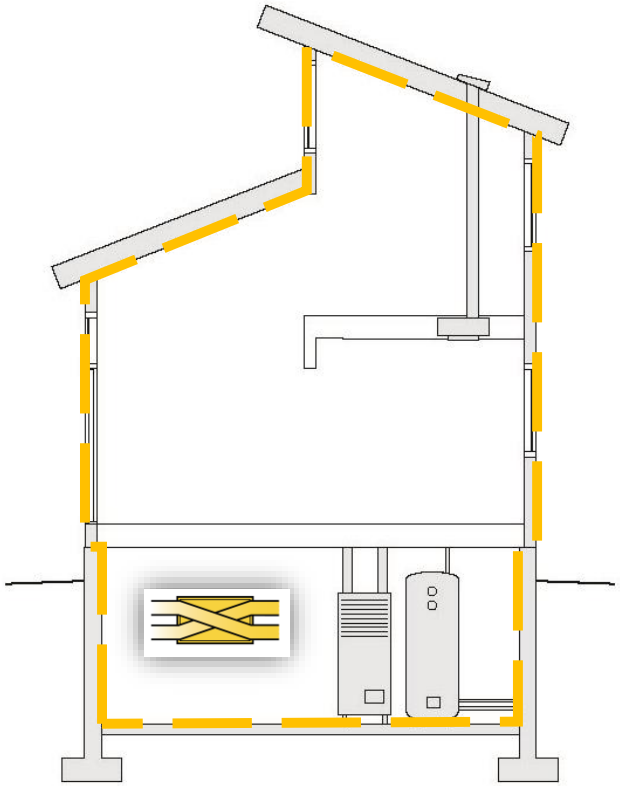
Working with Energy Advisor – Example Models



Reference House (Target)

- 9.36.5 compliant
- **2.5 ACH**
- Standard code-minimum insulation/windows
- Furnace heating
- Hot water tank
- No HRV

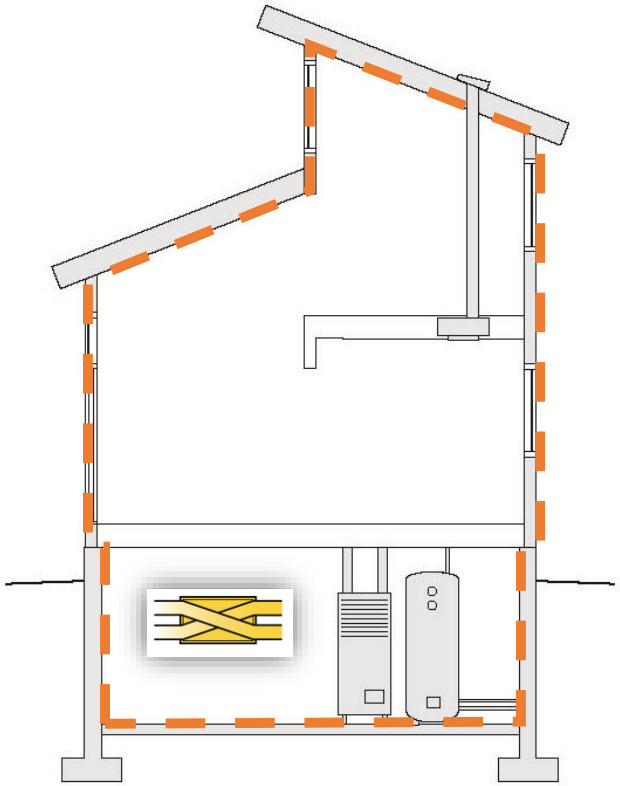
Working with Energy Advisor – Example Models



Example 1: Less Airtight

- **3.5 ACH**
- **R-22** effective walls or an **HRV** required to meet Step 1

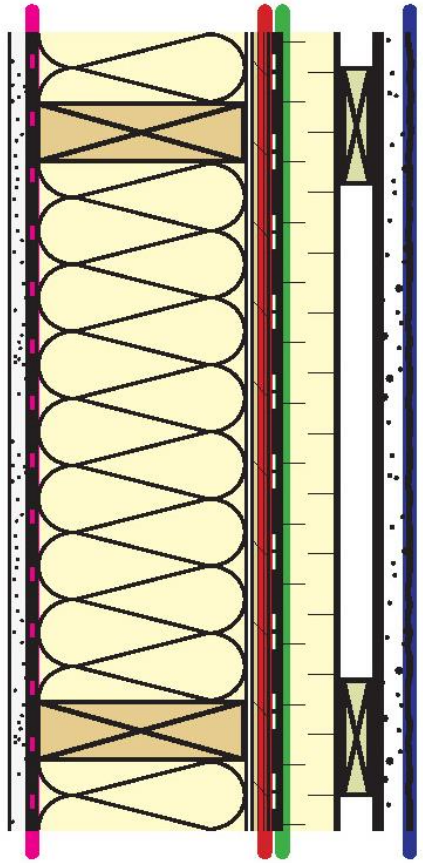
Working with Energy Advisor – Example Models



Example 2: Even Less Airtight

- **4.5 ACH**
- **R-28** effective walls or an **HRV + better windows** required to meet Step 1

What is an Air Barrier?



Water Shedding Surface

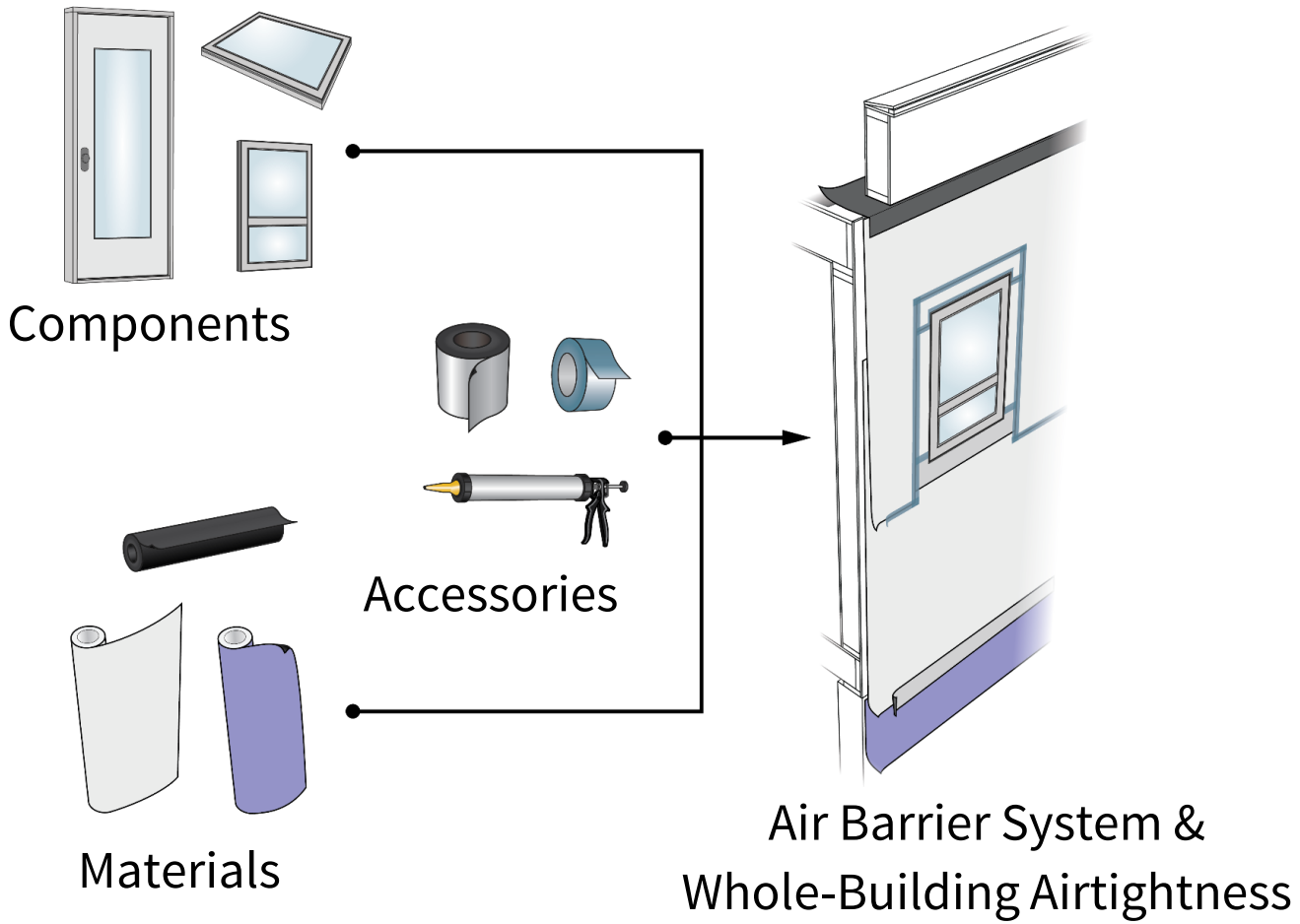
Water Resistive Barrier

Air Barrier

Vapour Retarder

Thermal Insulation

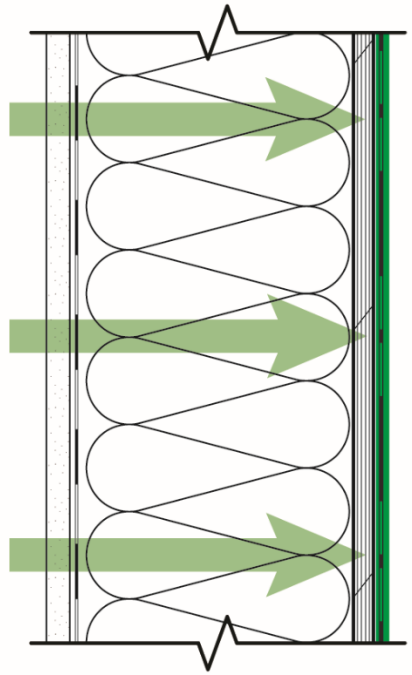
What is an Air Barrier?



Four Principles of the Air Barrier:

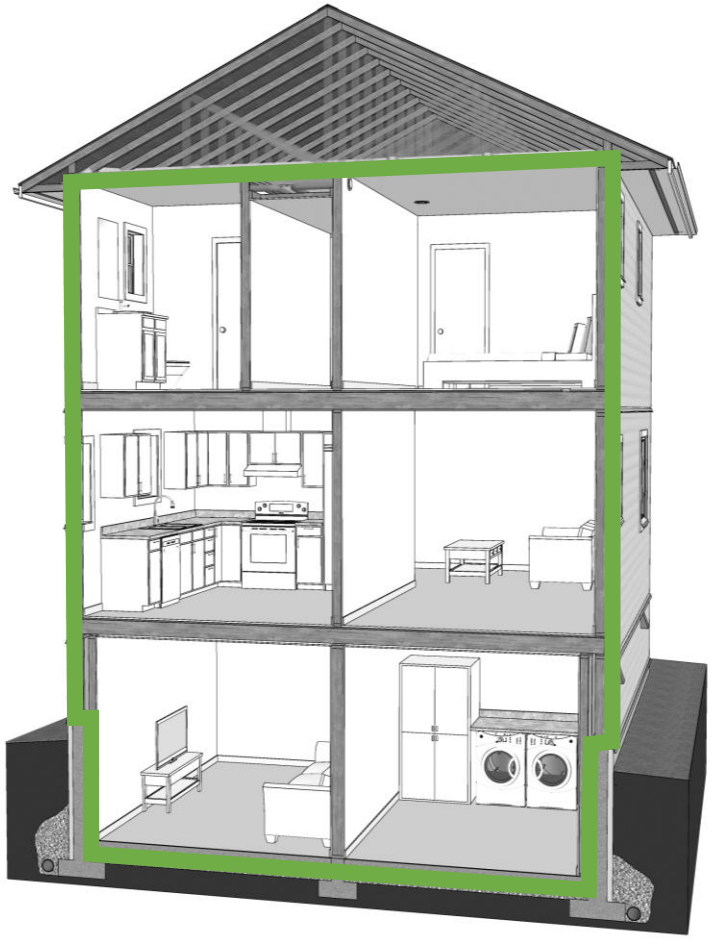
#1: Air Impermeable

- Material, Assembly, and Whole Building!



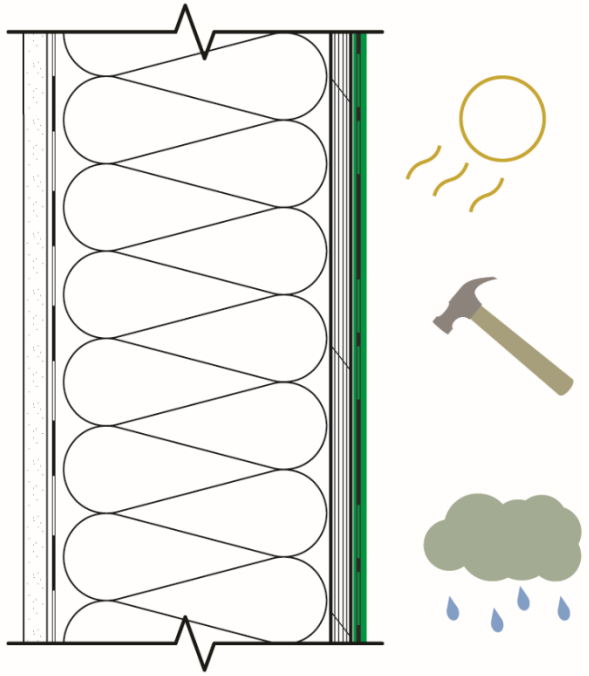
Four Principles of the Air Barrier:

#2: Continuous



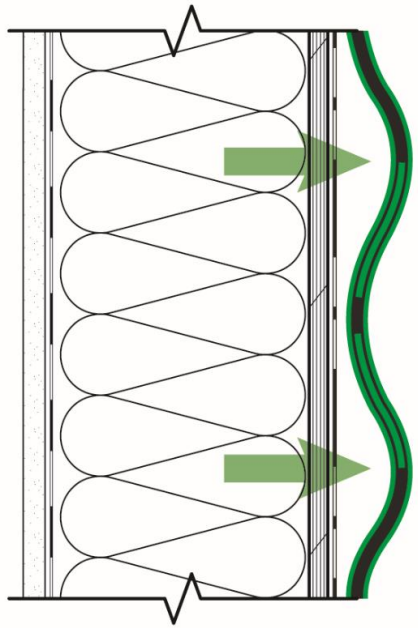
Four Principles of the Air Barrier:

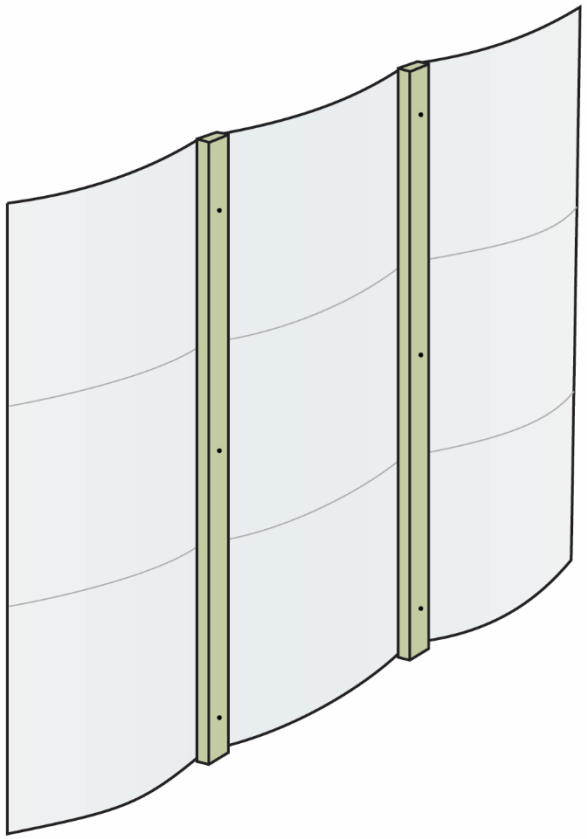
#3: Durable

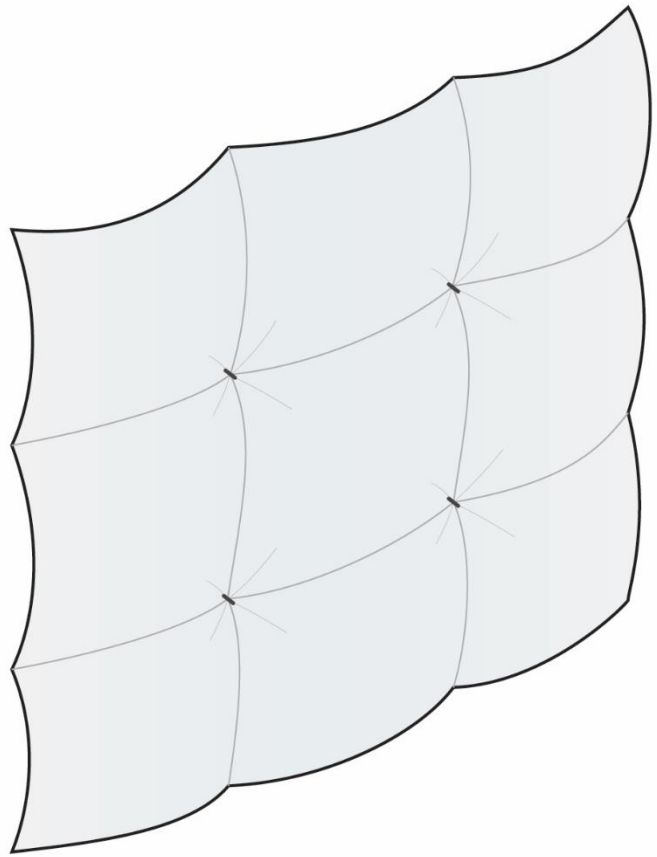


Four Principles of the Air Barrier:

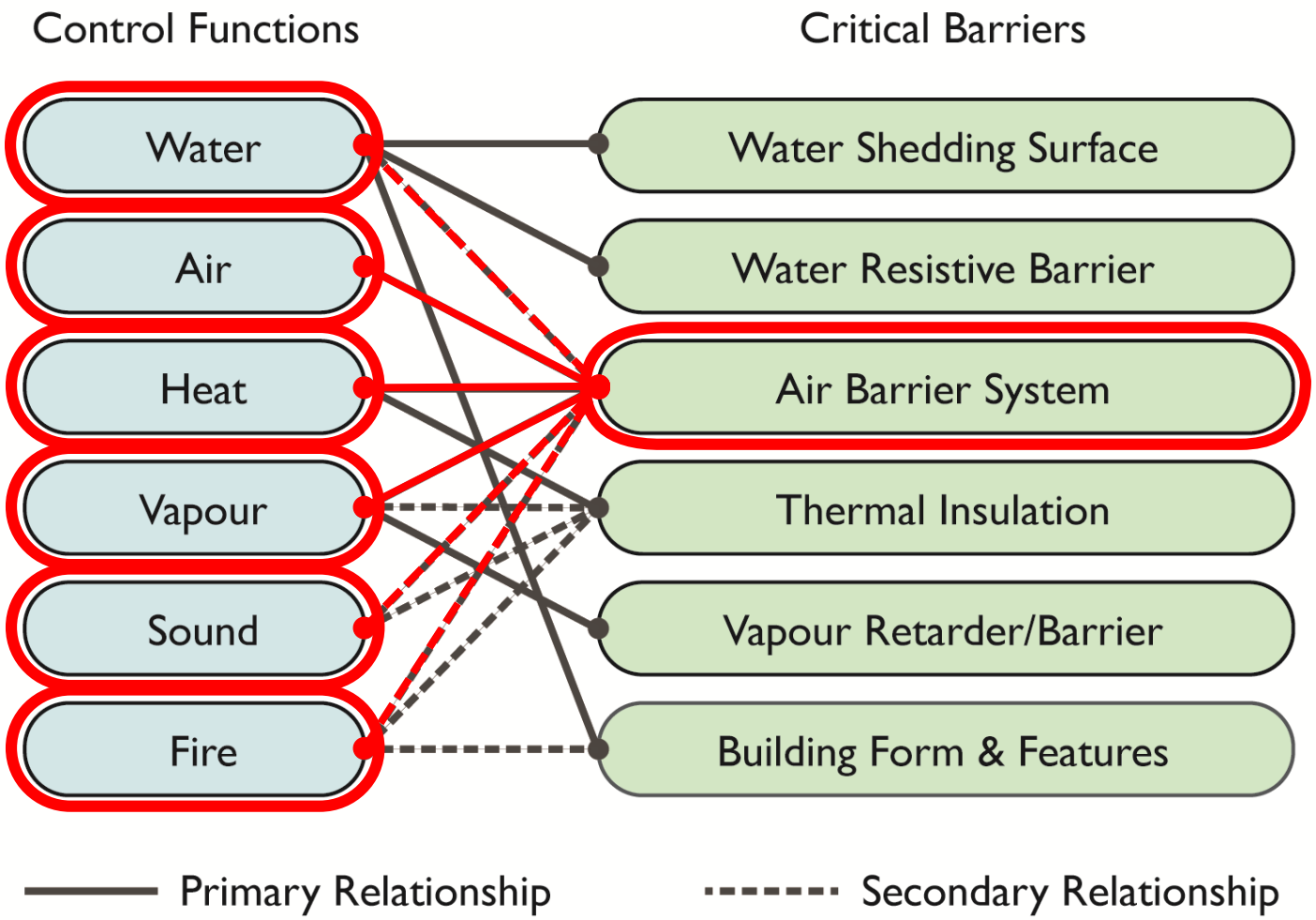
#4: Stiff and Strong



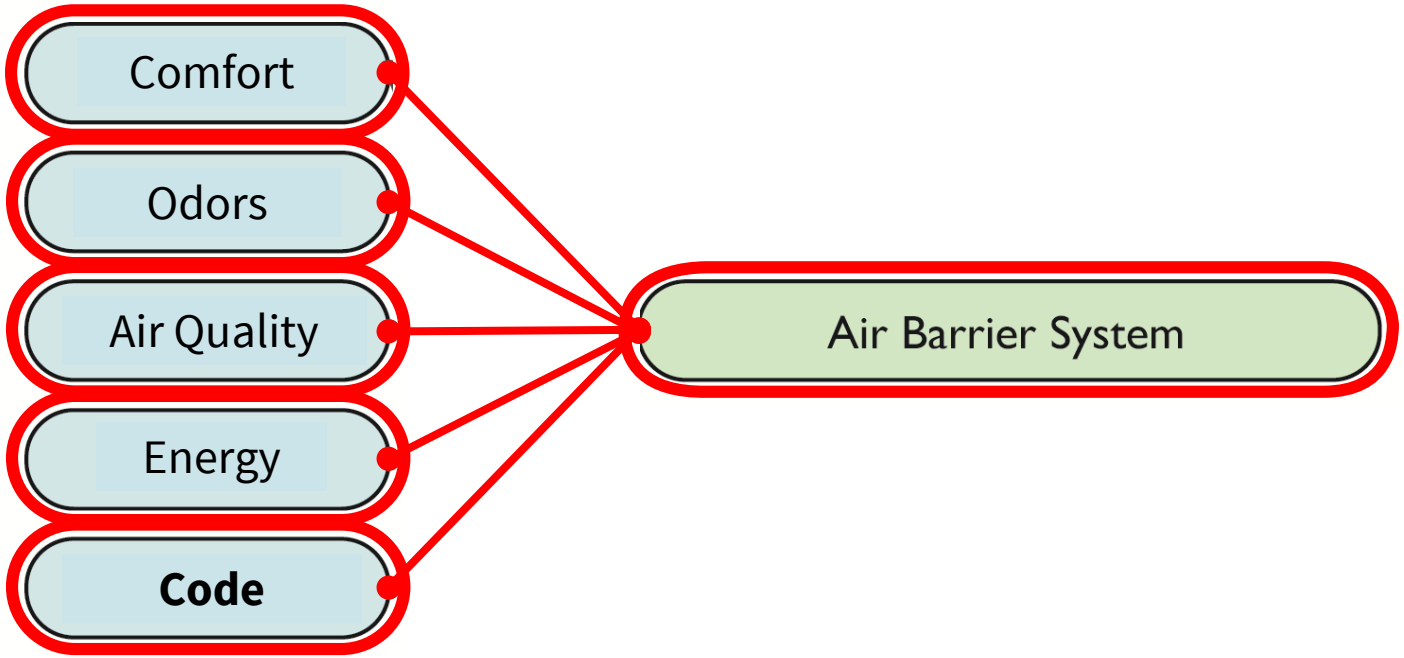




Why Build an Air Barrier?

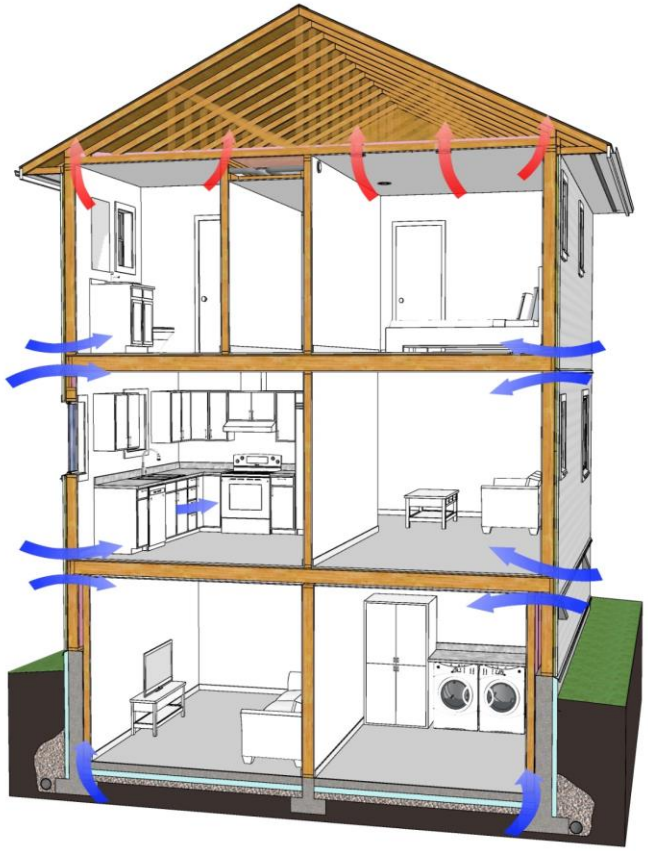


Why Build an Air Barrier?

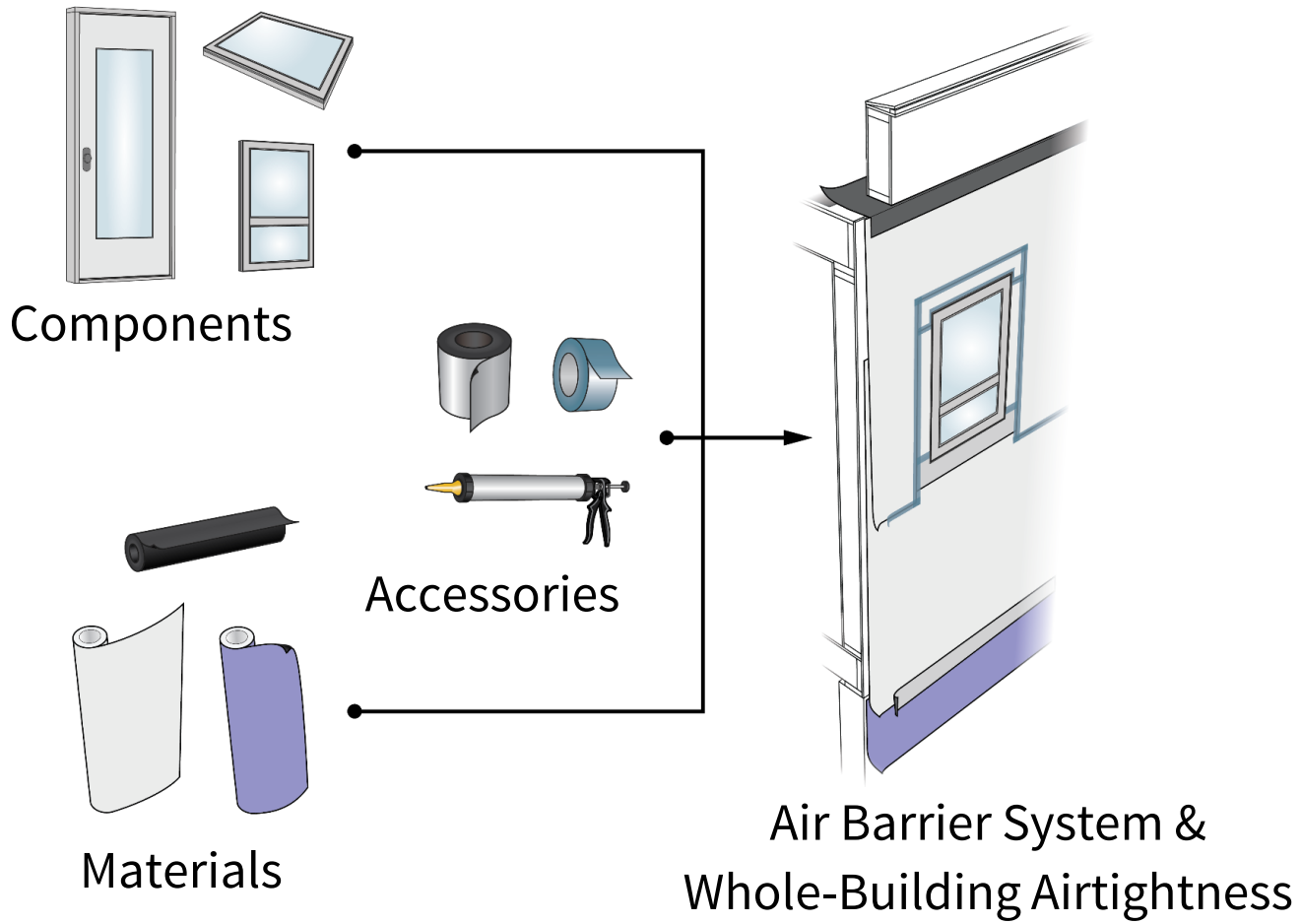


Why Build an Air Barrier?

- Reduce condensation risk within assemblies
- Reduce heat loss/heat gain & save energy
- Maintain adequate indoor air quality
- Increase thermal and acoustic comfort
- Required by code

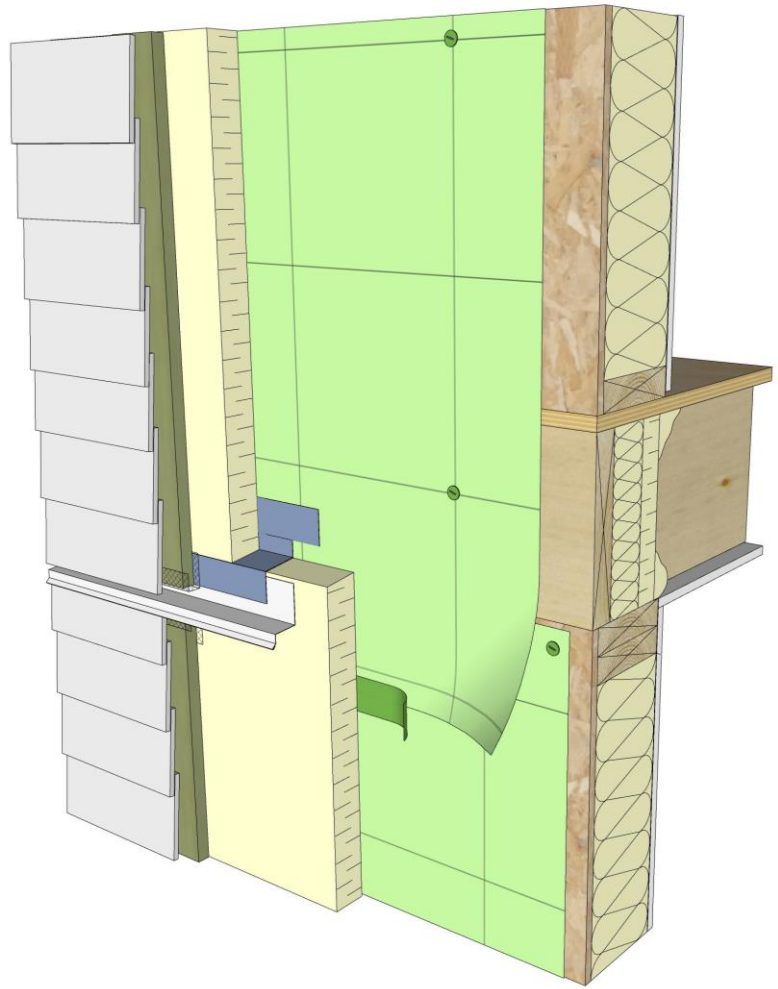


What Materials Comprise the Air Barrier?



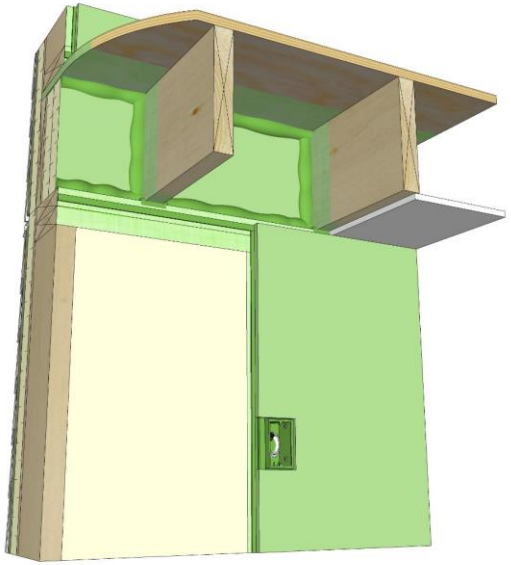
Air Barrier Materials

- **BCBC 9.25.3.2. Sentence 1**
- **BCBC 9.36.2.10 Sentence 1**
- Materials intended to provide the principal resistance to air leakage must be air impermeable.



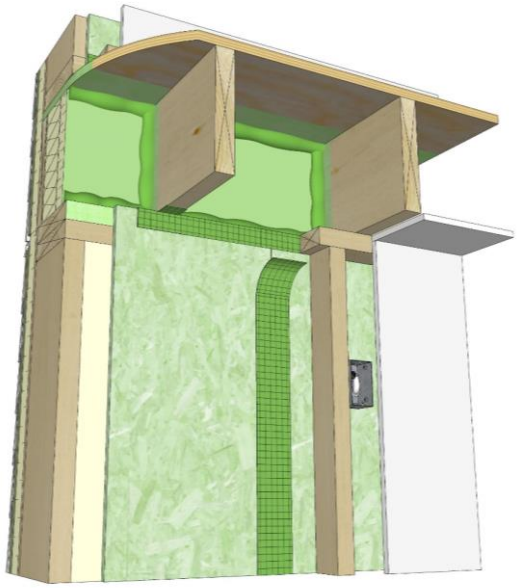
Wall Air Barrier Approaches: Interior

Spray Foam*



Airtight Drywall

Sealed Polyethylene

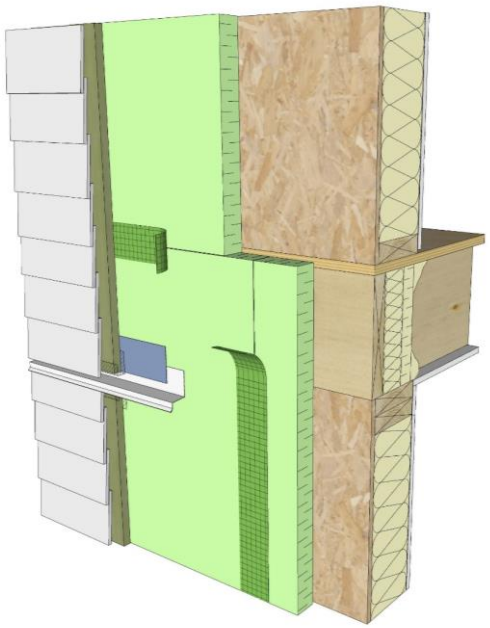


Sealed Sheathing
(with service cavity)

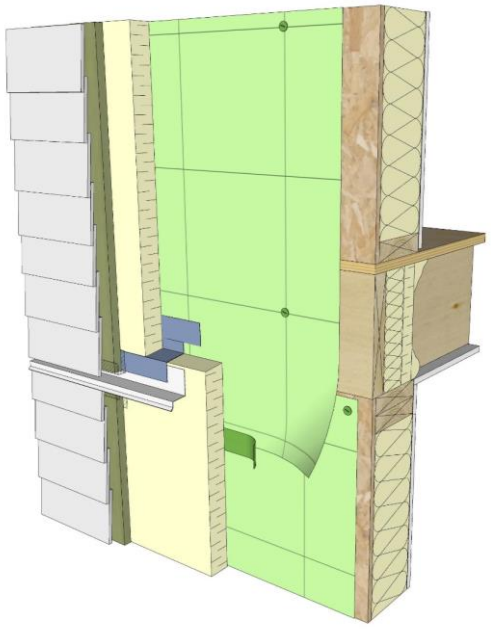
CONTRUCTABILTY

AIRTIGHTNESS

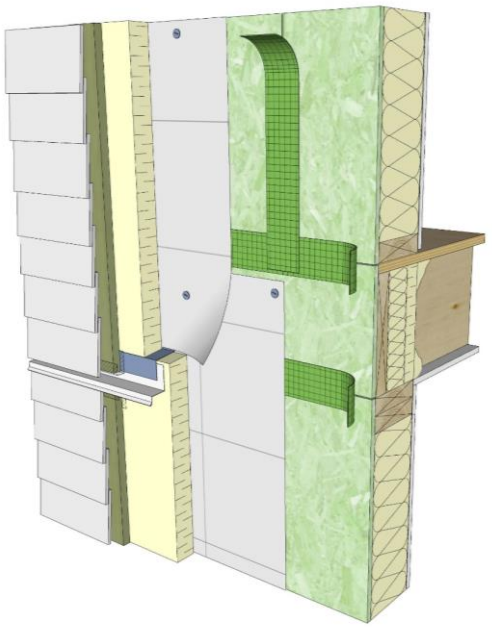
Wall Air Barrier Approaches: Exterior



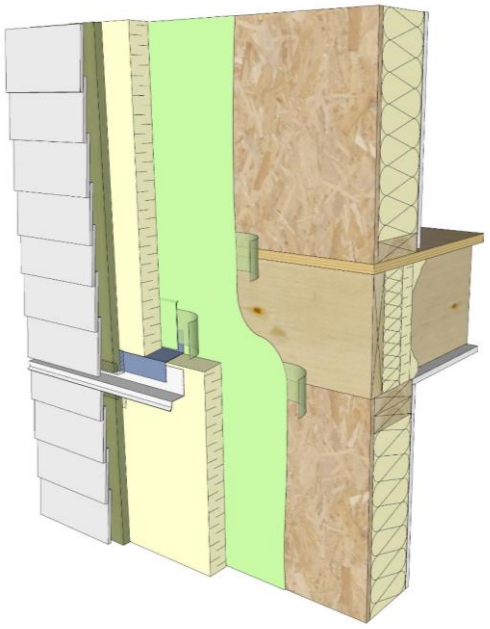
Sealed Insulation



Sealed Sheathing Membrane



Sealed Sheathing

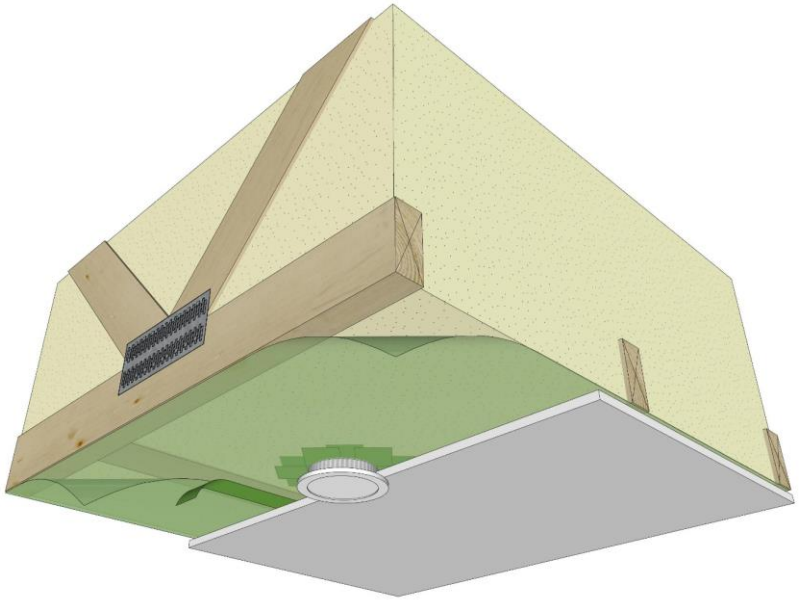


Liquid Applied

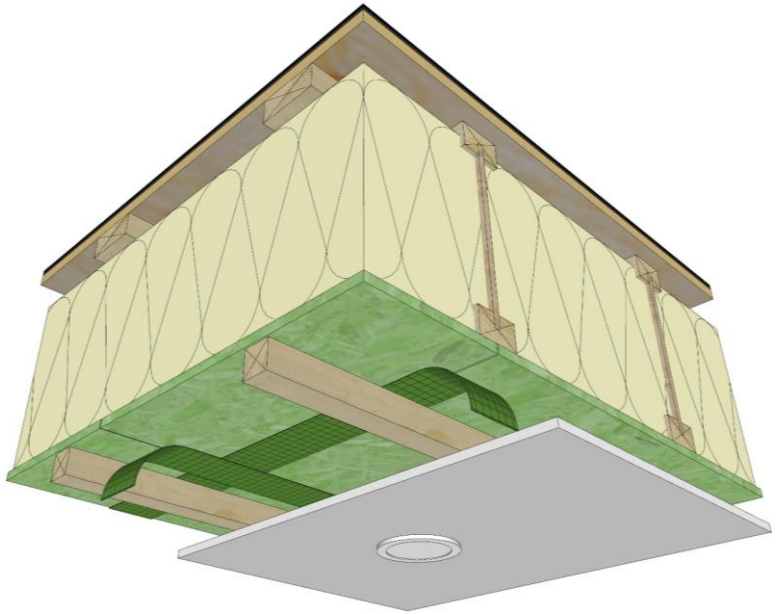
CONTRUCTABILTY

AIRTIGHTNESS

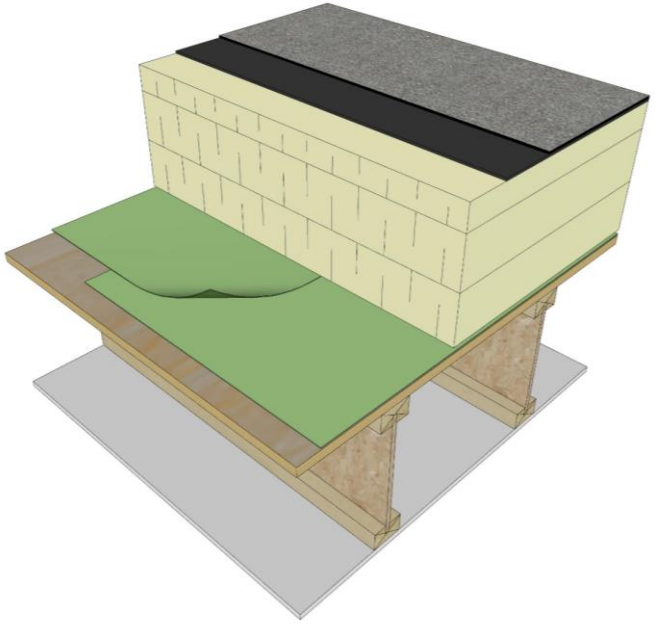
Roof/Ceiling Air Barrier Approaches



Sealed Interior Polyethylene



Sealed Interior Sheathing
(with service cavity)

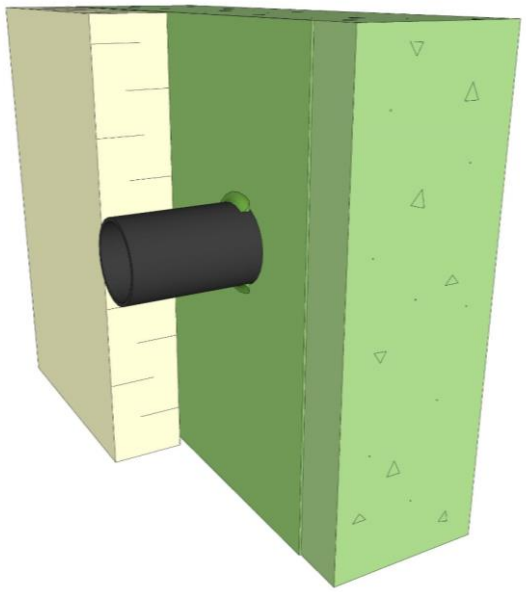


Self-adhered Exterior Membrane*

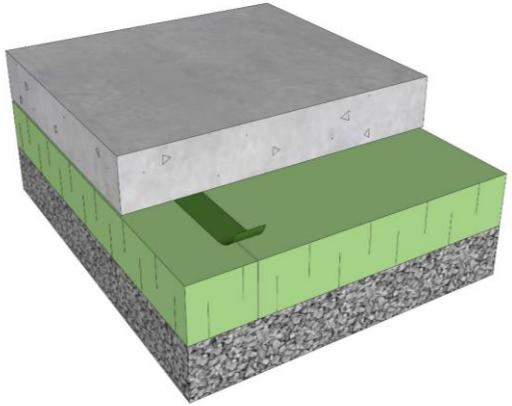
CONTRUCTABILTY

AIRTIGHTNESS

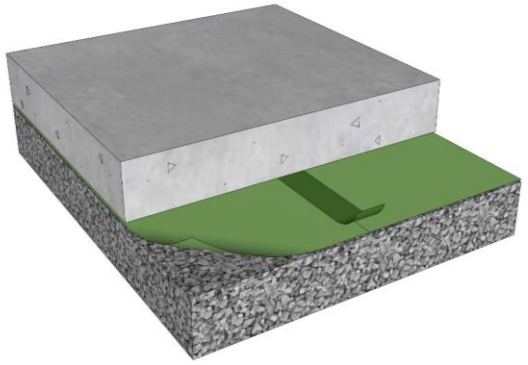
Below-Grade Air Barriers



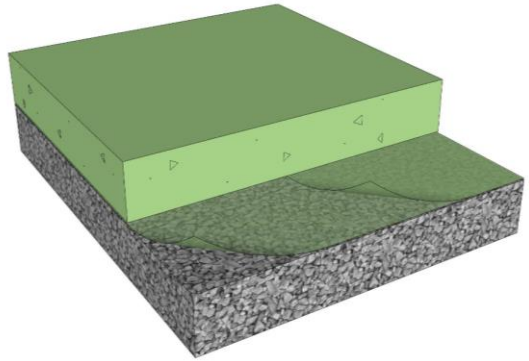
Foundation Wall



Sealed Insulation



Sealed Polyethylene



Slab + Polyethylene

CONTRUCTABILTY

AIRTIGHTNESS

Air Barrier **Accessories** - Important Part of Airtightness

Tapes

Sealant

Spray Foam

CONTRUCTABILTY

AIRTIGHTNESS

Air Barrier **Accessories**

Tapes

- Standard acrylic tape (blue/red)
- Self-adhered membrane
- High-performance sheathing/detailing tape

Air Barrier **Accessories**

Sealant

- Consumer-grade
  - Acrylic/Latex
- Construction-grade
  - Acoustic sealant
- Commercial grade sealants
  - Silicone
  - Urethane
  - Hybrid

RDH

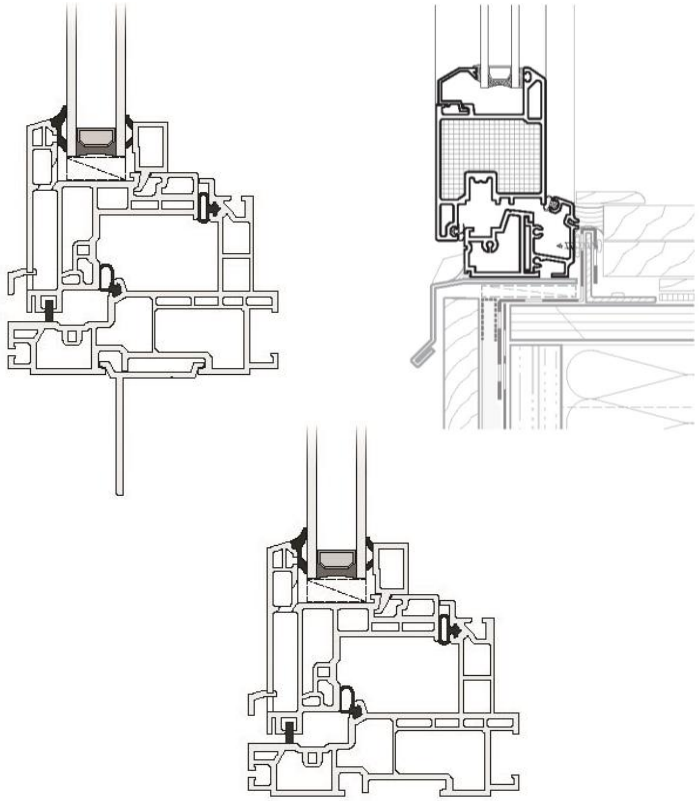
Air Barrier **Accessories**

Spray Foam

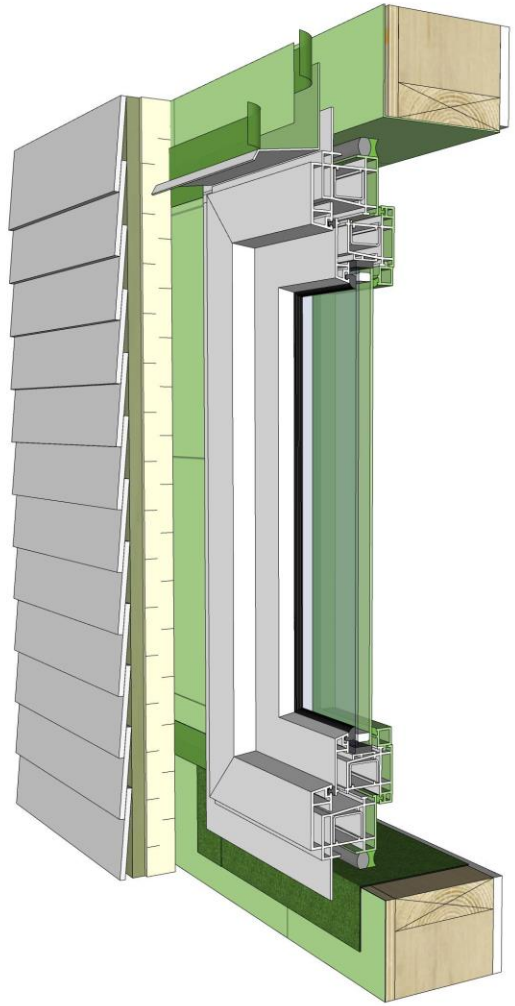
- Consumer-grade
  - Spray can/straw applicator
- Construction-grade
  - Two-part pre-packaged polyurethane
- Commercial-grade
  - Two-part truck-based applications
    - Open-cell
    - Closed-cell

RDH

Air Barrier **Components**

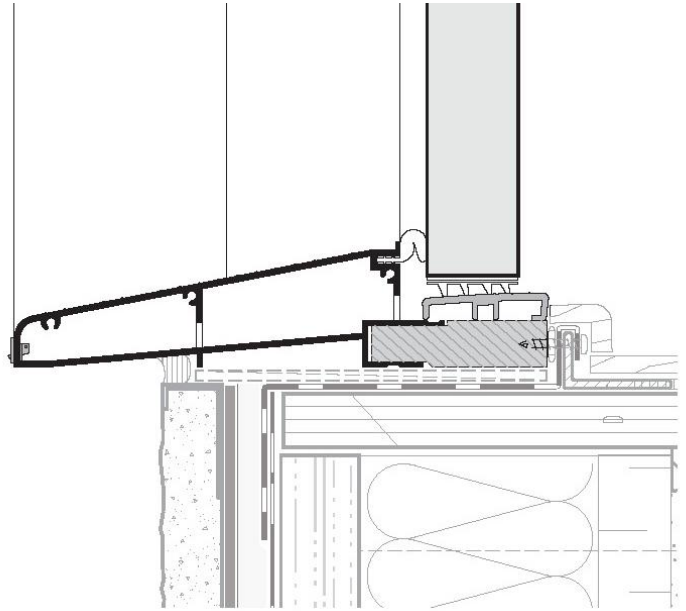


Windows & Doors



Air Barrier **Components**

- Ratings for airtightness of windows and doors is based on NAFS requirements.
- Manufacturers should provide the test data/certification
- **Airtight front entry doors** can be difficult to source, but look for NAFS airtightness rating data



Air Barrier **Components** – NAFs Airtightness Ratings

“A2”

≤ 1.5 L/s·m²

(0.30 cfm/ft²)

“A3”

≤ 0.5 L/s·m²

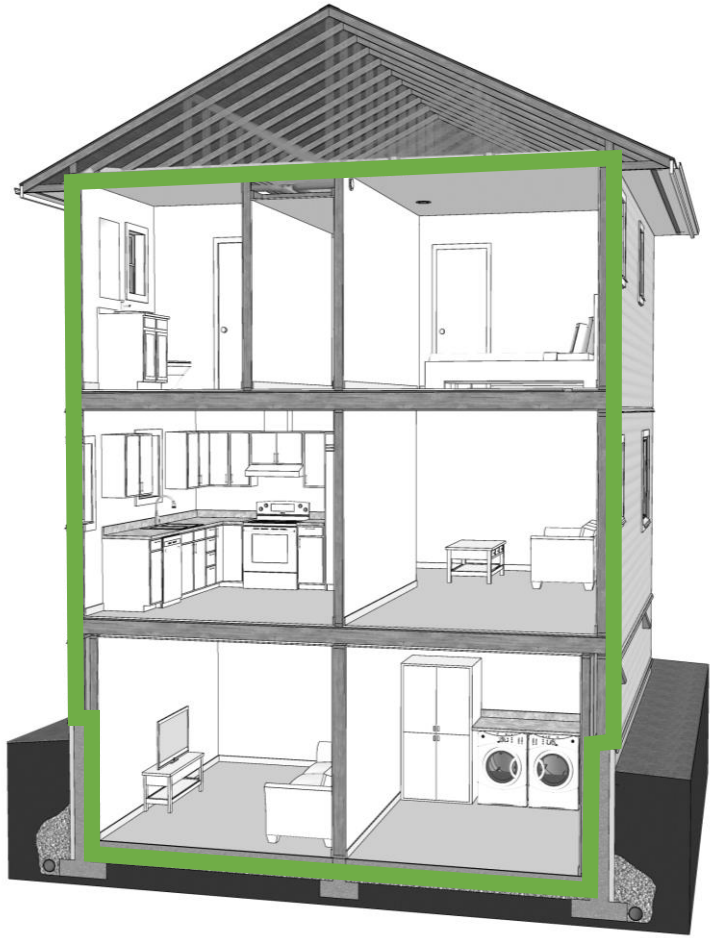
(0.10 cfm/ft²)

“Fixed”

≤ 0.2 L/s·m²

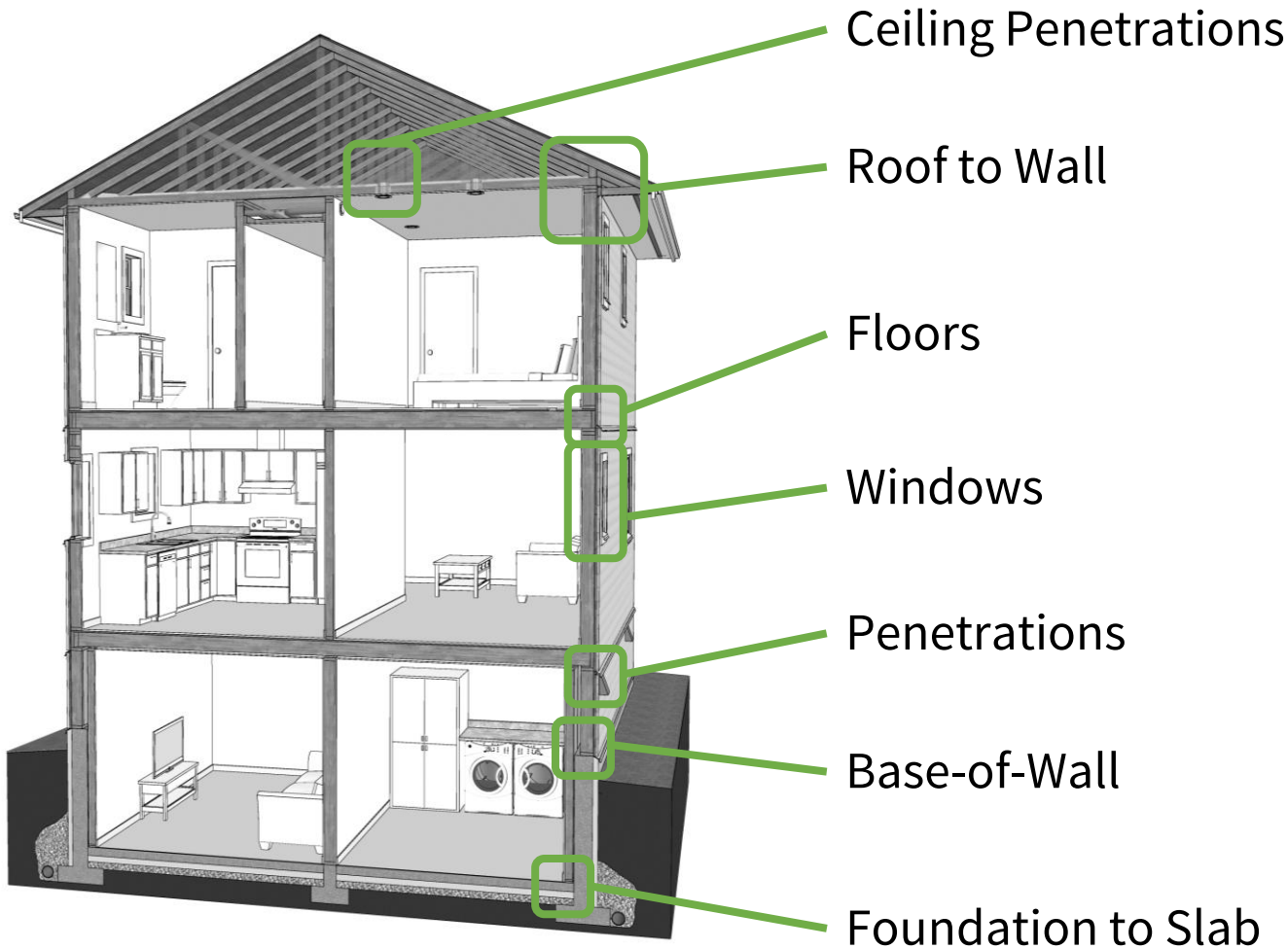
(0.04 cfm/ft²)

Air Barrier Details & Planning

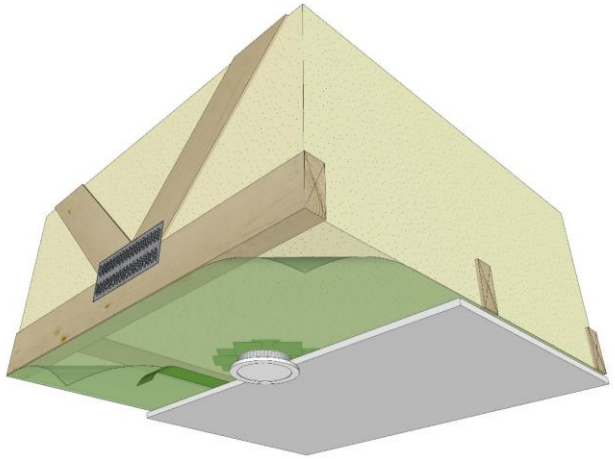


- Continuity around the whole building
- Sequencing & constructability
- Details at transitions and penetrations
- Which trades/applicators?

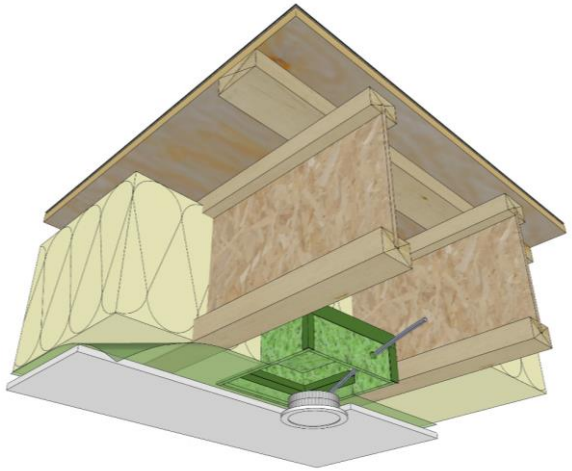
Air Barrier Details & Planning



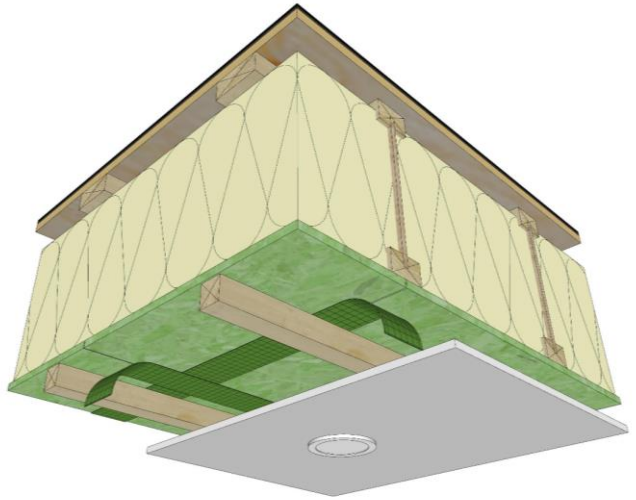
Air Barrier Details: Ceiling Penetrations



Direct seal

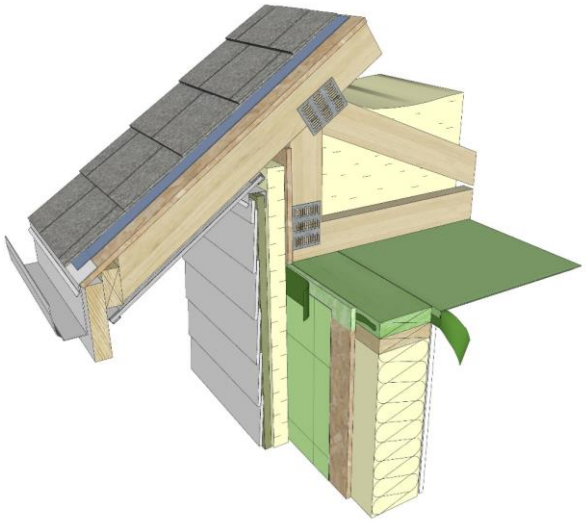


Airtight boxes

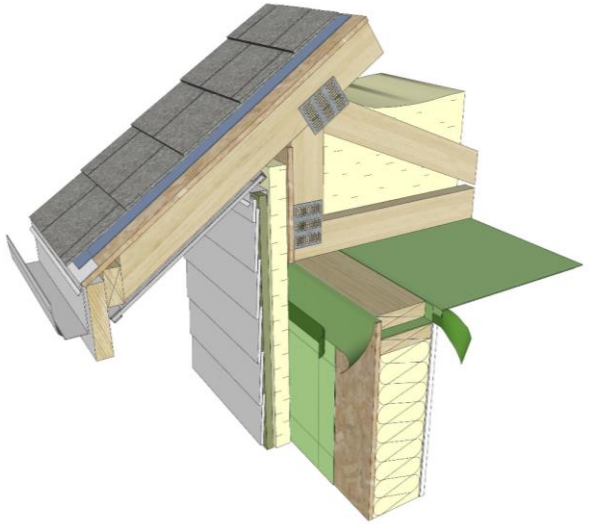


Service cavity

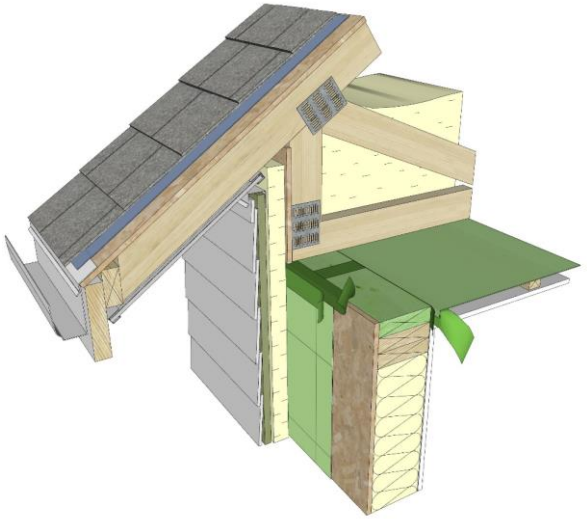
Air Barrier Details: Roof to Wall *(more to come on this)*



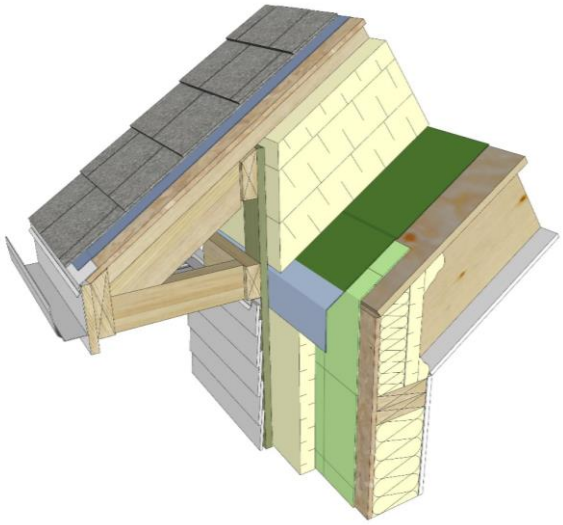
Sealant



Membrane Pre-strip



Taped top plate



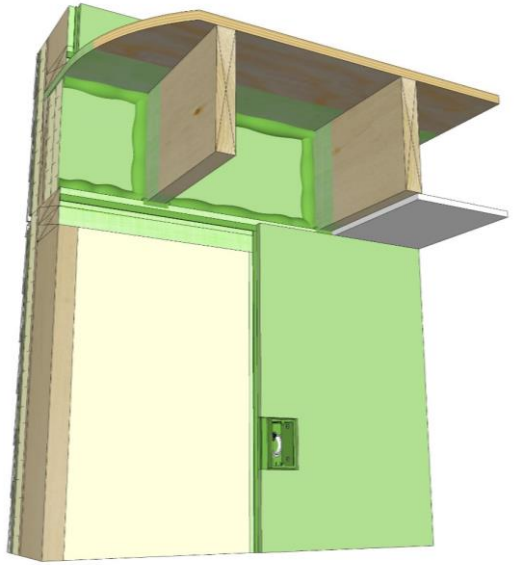
Exterior

Air Barrier Details: Floors

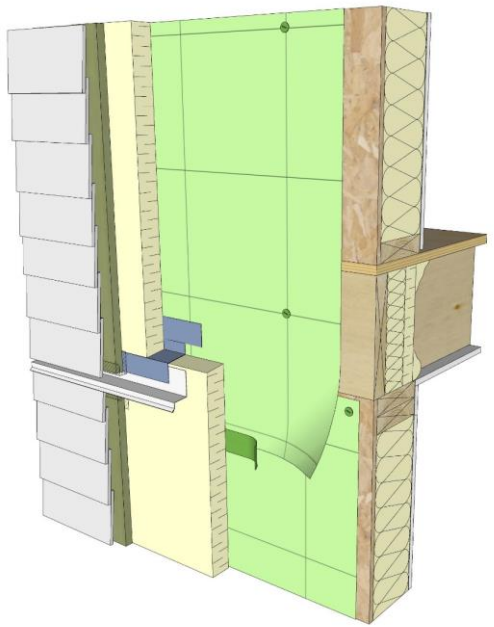
Not shown:

- sealed polyethylene
- membrane pre-strip

Spray foam

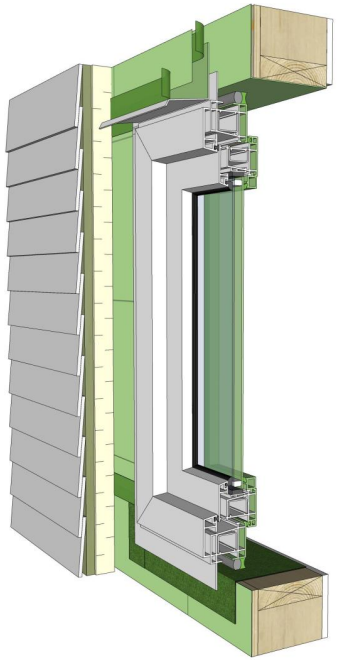


Sealed insulation blocks



Exterior

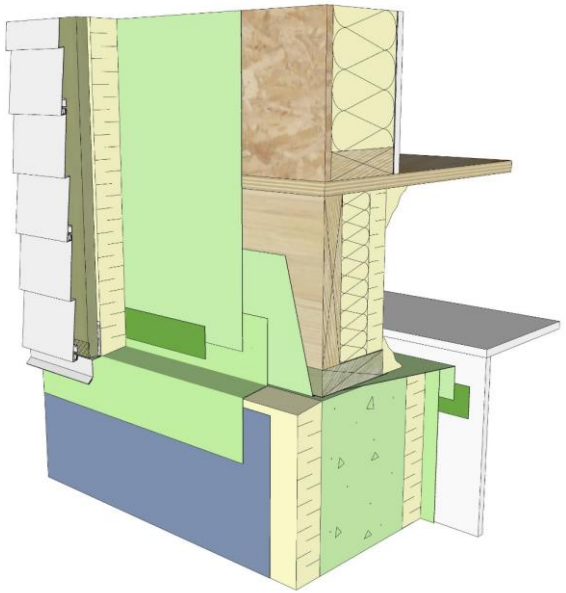
Air Barrier Details: Windows



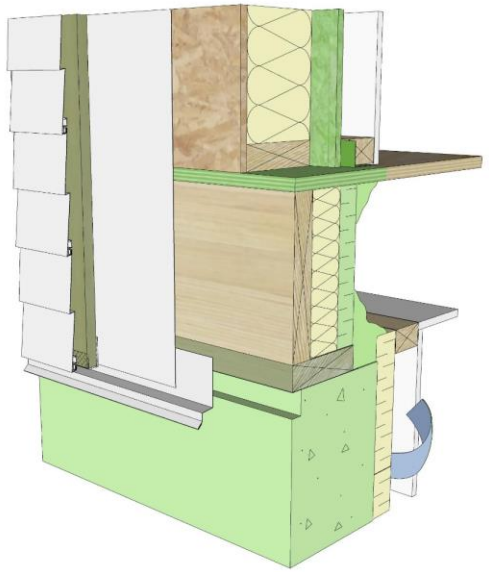
Perimeter sealant

Sealant + sill angle

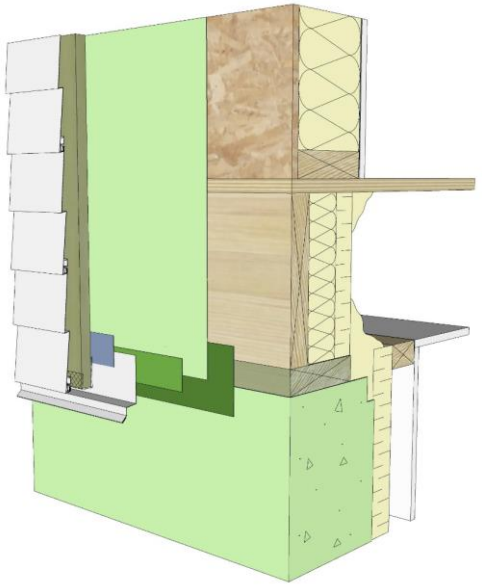
Air Barrier Details: Base of Wall



Pre-strip

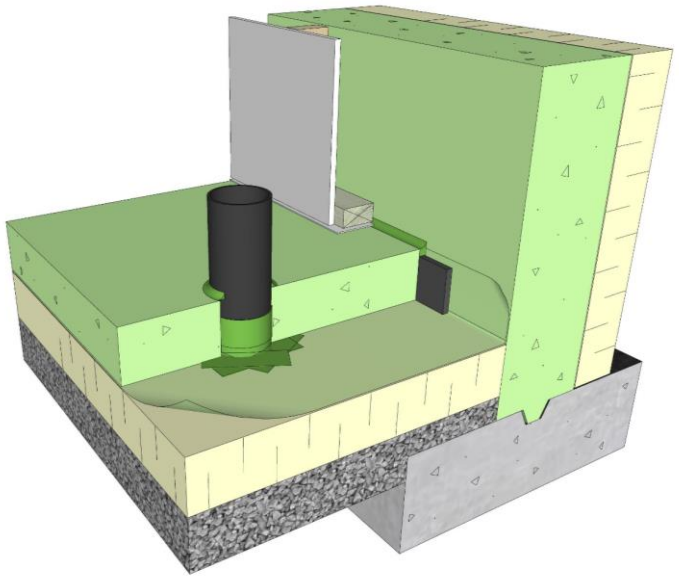


Interior seal (with foam or **tape**)

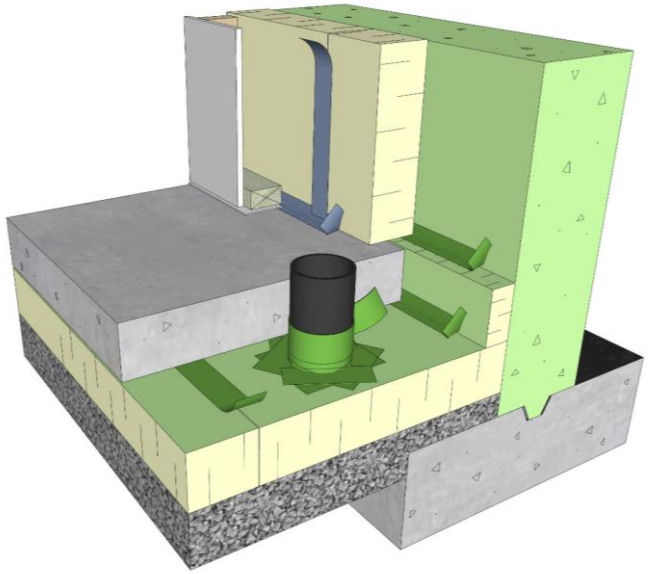


Exterior

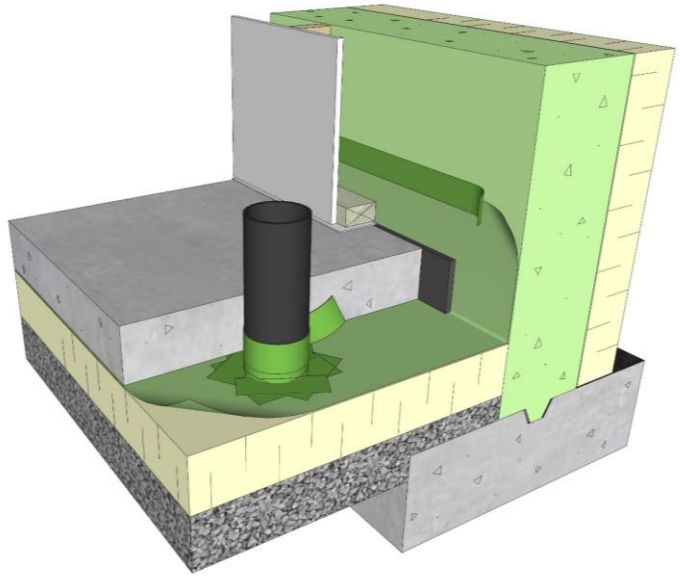
Air Barrier Details: Foundation to Slab



Slab sealant



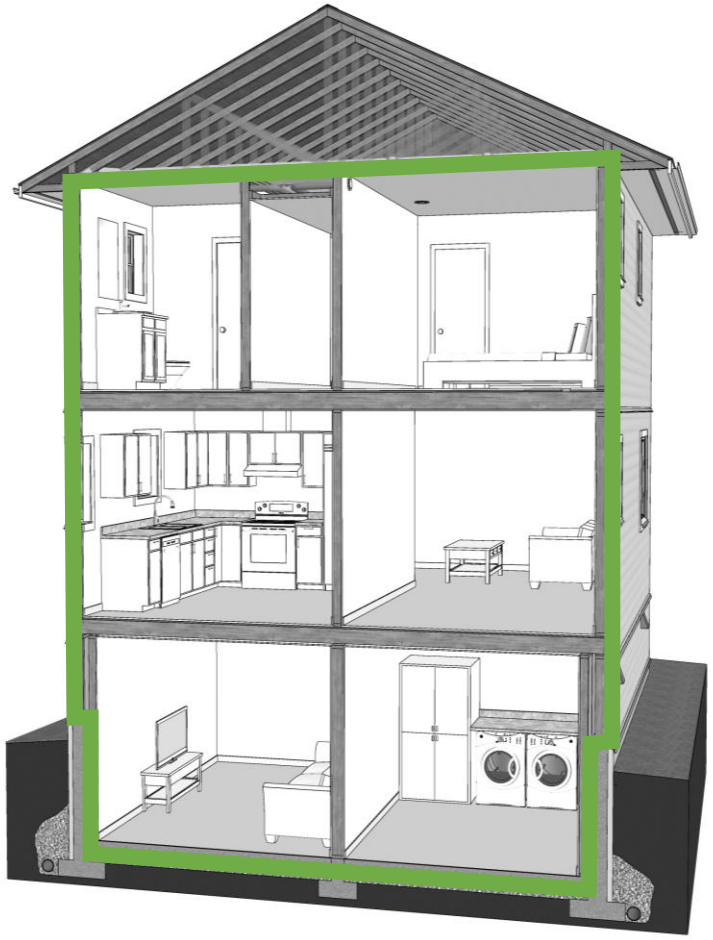
Taped insulation



Taped membrane

Air Barrier Best Practices

- Separate framing work from air barrier components wherever possible
- Use approaches that don’t drastically change common construction sequencing
- Use “inspectable” approaches that don’t rely on blind seals
- Keep it simple and buildable



RDH

Air Barrier Best Practices

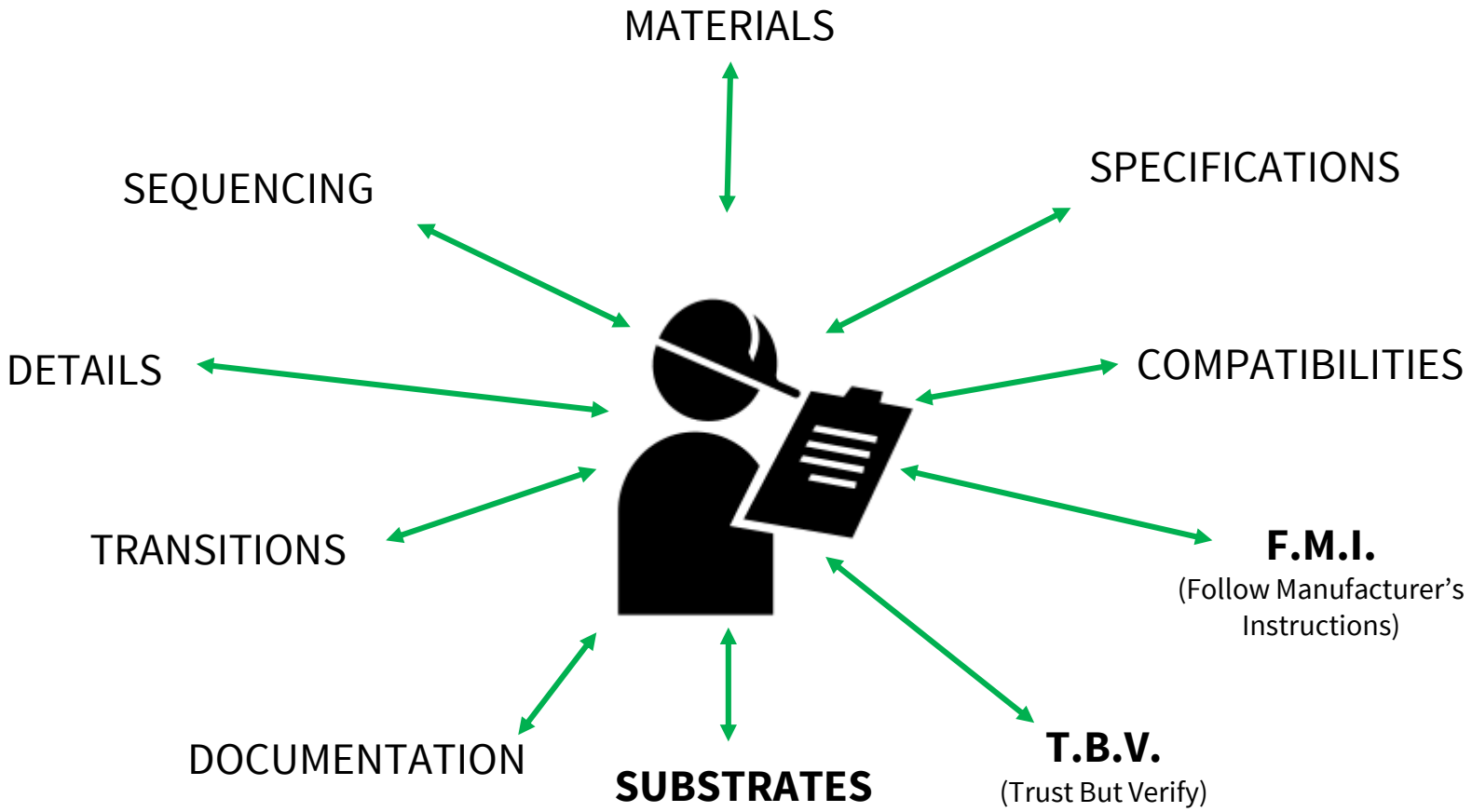
- Architects/Designers
  - Show Air Barrier in all sections
  - Show transitions between materials
  - Identify all materials
- Builders
  - “Air Boss”
  - Penetrations checklist
  - Use the right material for the job
  - Subcontractors do not put holes in Air Barrier
  - Communication among trades
  - **Show up for mid-construction test**
  - **Have a Plan**

RDH

Air Barrier Installation

Building Envelope Supervisor – “The Air Boss”

Employed by Contractor - Oversees All Installers



RDH

Quality Control

- Noticeable improvements as soon as somebody cares – specific people designated to look at air barrier
- Coordination between all team members essential

Air Boss

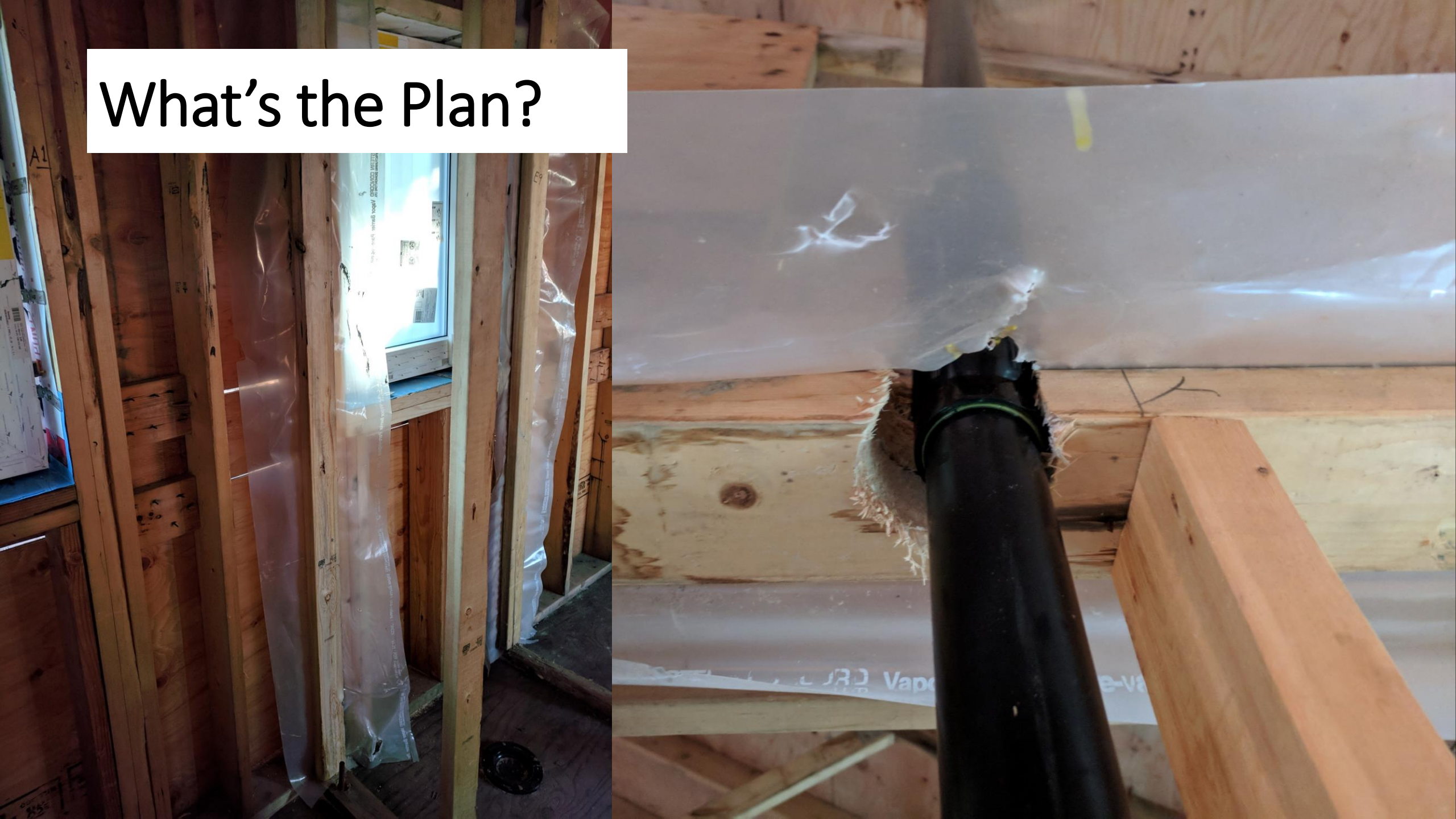
RDH

Quality Control: Subtrades

- **Framing** - top floor partition walls, exterior pre-stripping?
- **Electrical** – receptacles, upper floor ceiling fixtures
- **Plumbing** –vent stacks, fixtures on exterior walls
- **HVAC** – service vents/ducts
- **Insulation/Poly/Drywall** – floor joists, partition walls, receptacles/fixtures, ceiling poly, finishing/cutting
- **Cladding** – exterior penetrations, sealed exterior membrane?

RDH

What's the Plan?



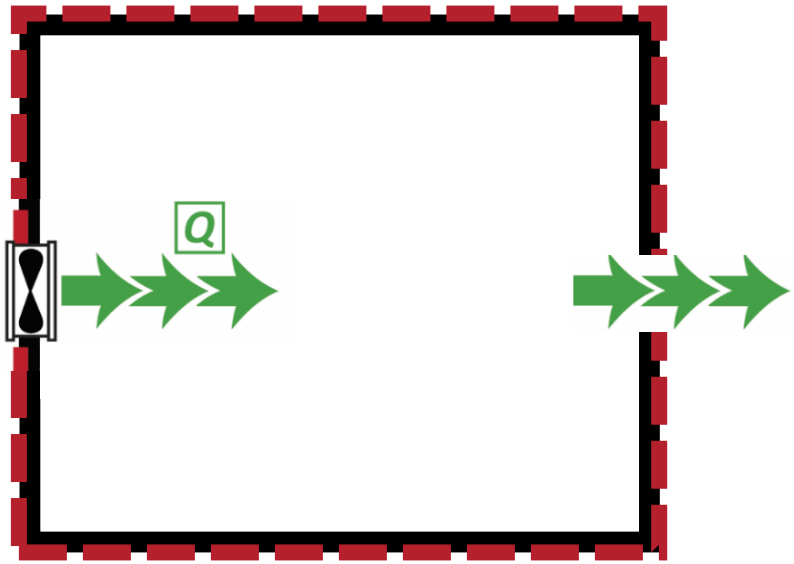
What's the Plan?

What's the Plan?

Airtightness Testing

Airtightness Testing & Metrics

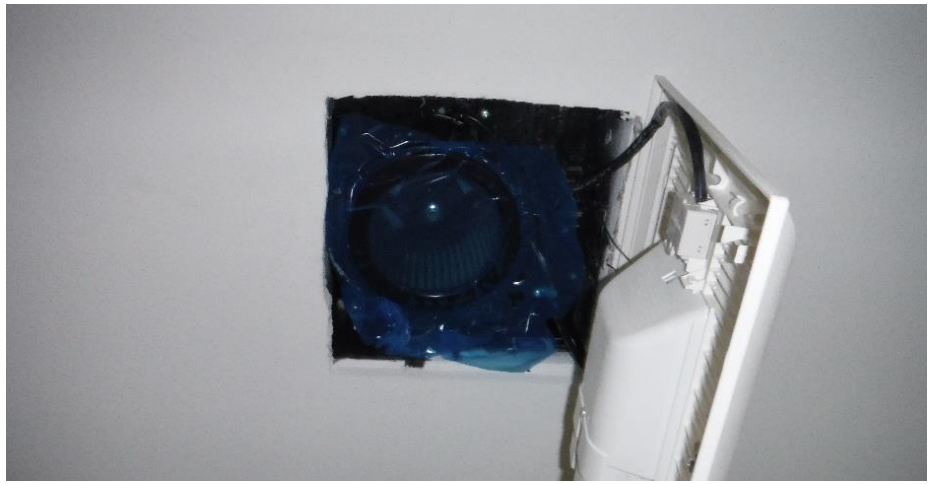
Airflow In = Airflow Out



RDH

Airtightness Testing – Building Prep?

- Multiple test standards available
- Confirm method with Energy Advisor
- Most common approach uses “in service” conditions, with mechanical vents left as is (CAN-CGSB 149.10)
- Some approaches require sealing mechanical vents (ASTM E779 /USACE)



RDH

Mid-Construction Airtightness Test

- Used to verify building airtightness targets air likely to be met (before finishes)
- Often required by jurisdictions and offered by Energy Advisors
- **Only useful if the air barrier is substantially complete**
  - **All windows, doors, mechanical/plumbing/electrical penetrations installed and sealed?**
  - **Ceiling poly installed?**
  - **Laps taped and sealed?**
  - **Plumbing traps filled?**
- Should be attended by installers and site superintendent

RDH

Airtightness Testing - Qualitative

- “Pre-drywall” testing
- Smoke tracer testing
  - Fog generator
  - Vape
  - Incense
  - Feather?
  - Smoke pencil
- Thermographic Camera

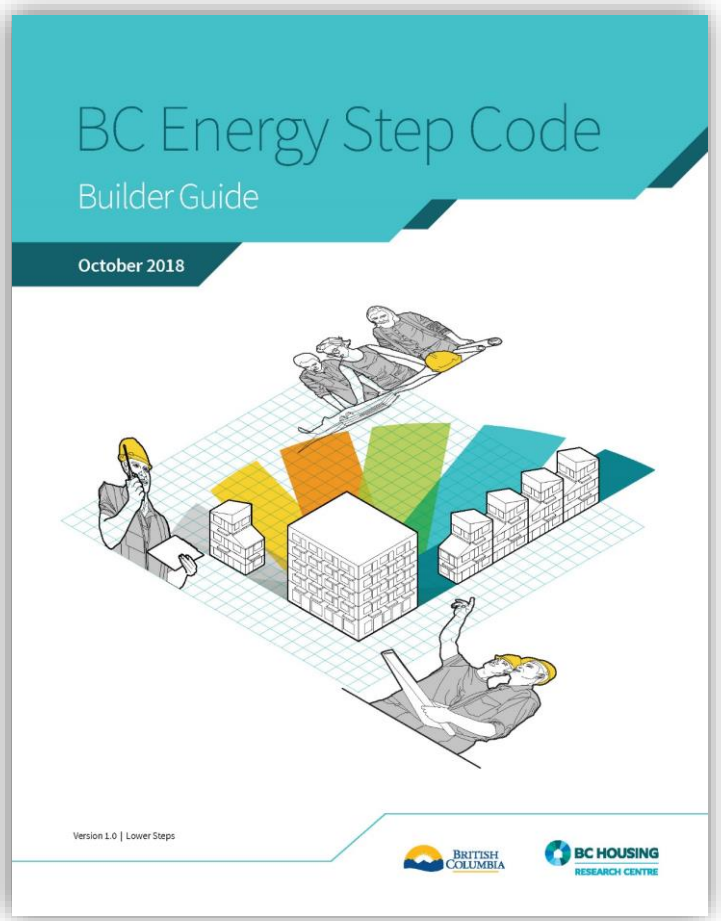
RDH

Airtightness Testing - Qualitative

- Basic qualitative testing/investigation should be offered by your **Energy Advisor**
- Walk-through to identify areas of concern

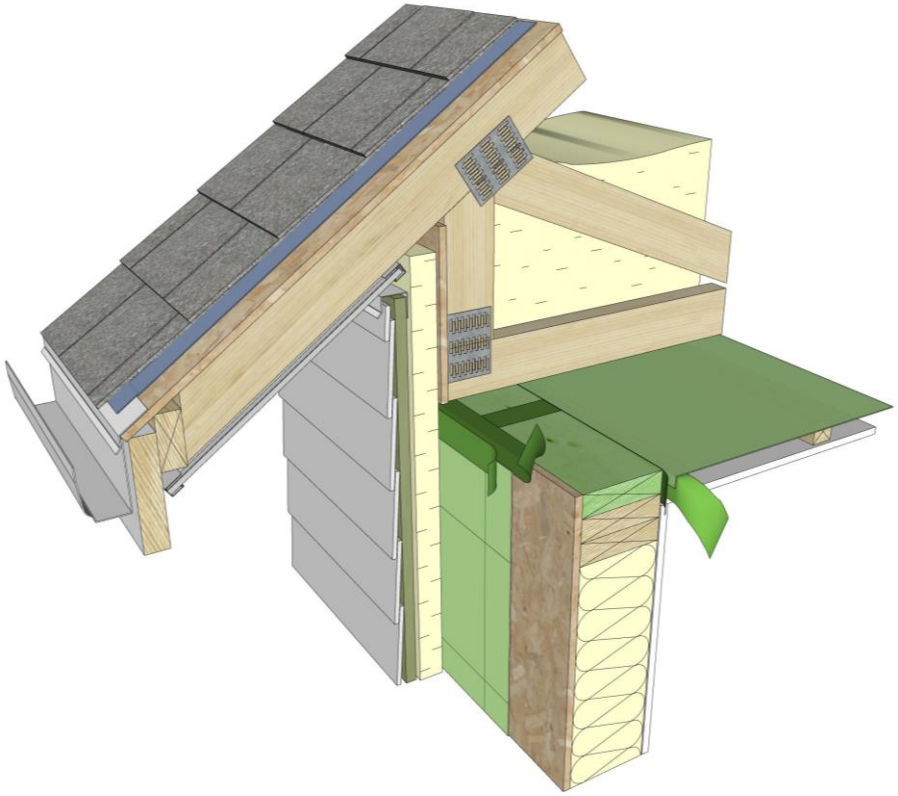
Additional Resources

- *BC Energy Step Code Builder Guide*
- *Energystepcode.ca*



Important Detail: **Roof to Wall**

- **Exterior** wall air barrier to **interior** ceiling air barrier is a common approach
- Requires careful coordination, materials, and well-planned methods
- Aim should be to avoid extra work for framers, insulators, and cladders

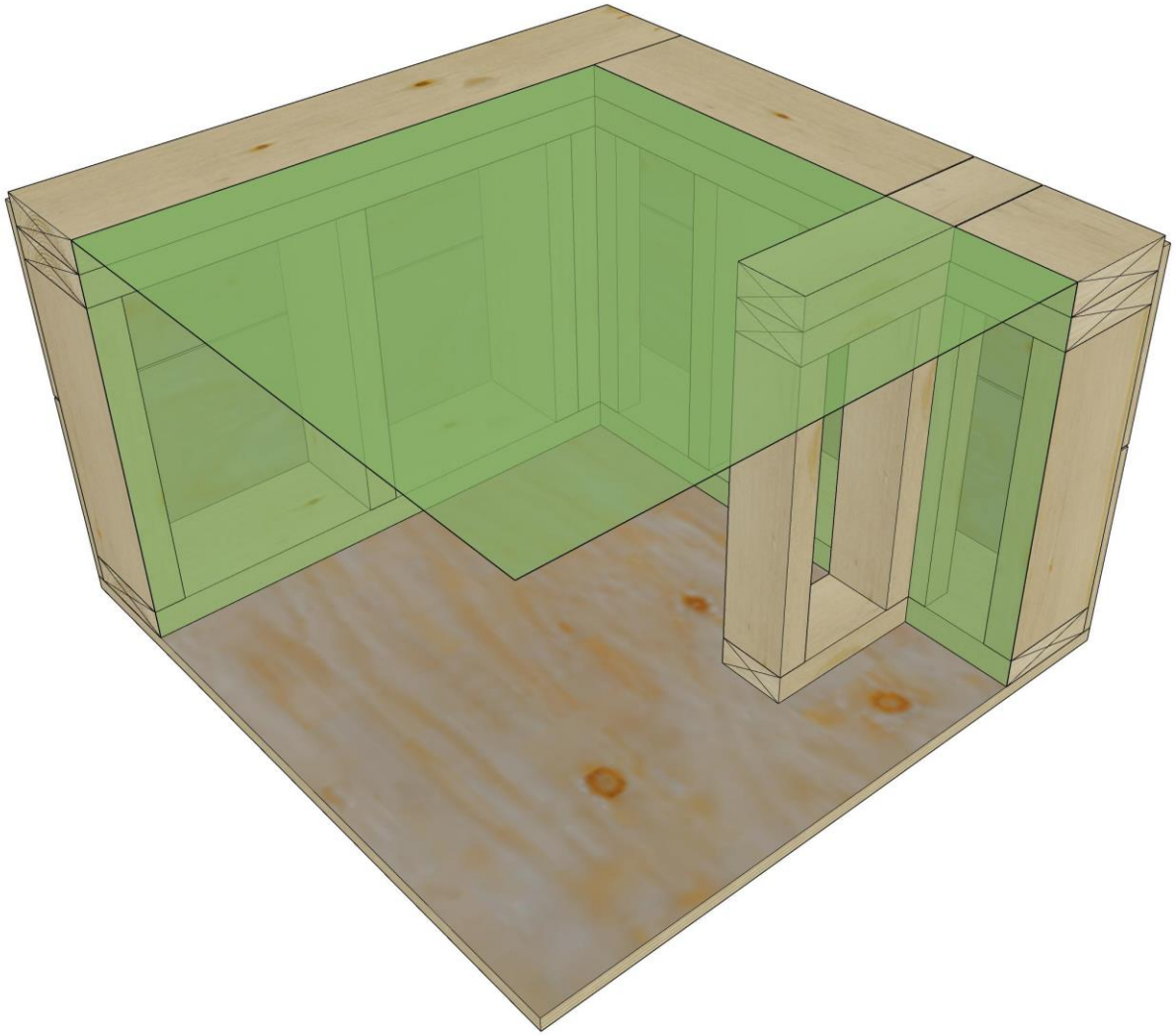


Important Detail: **Roof to Wall**

- “Traditional” methods are problematic:
  - No methods to seal top plate pre-strips
  - Sealing poly behind partition walls is not consistent

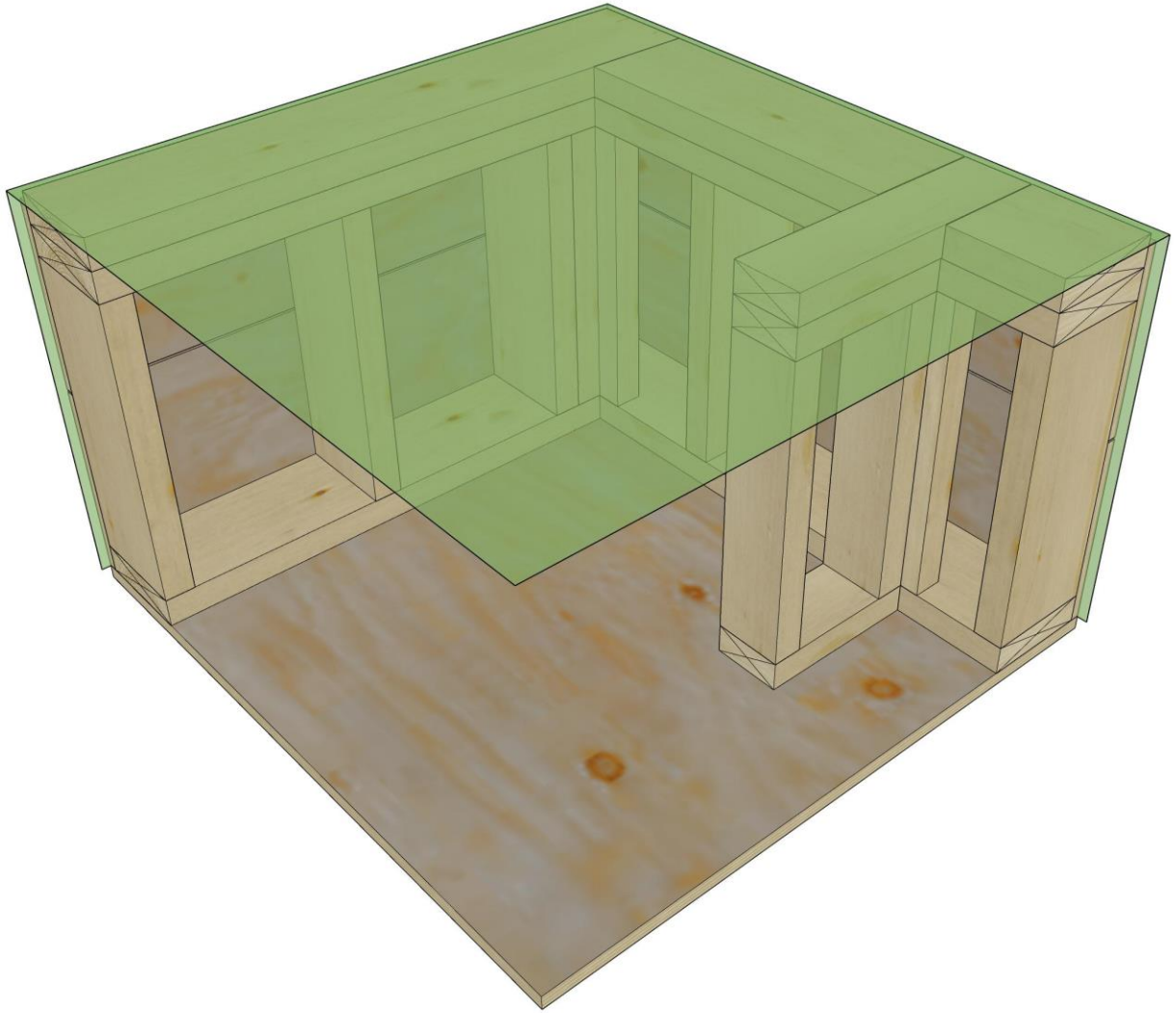
Important Detail: **Roof to Wall**

- Interior partition walls are always in the way?



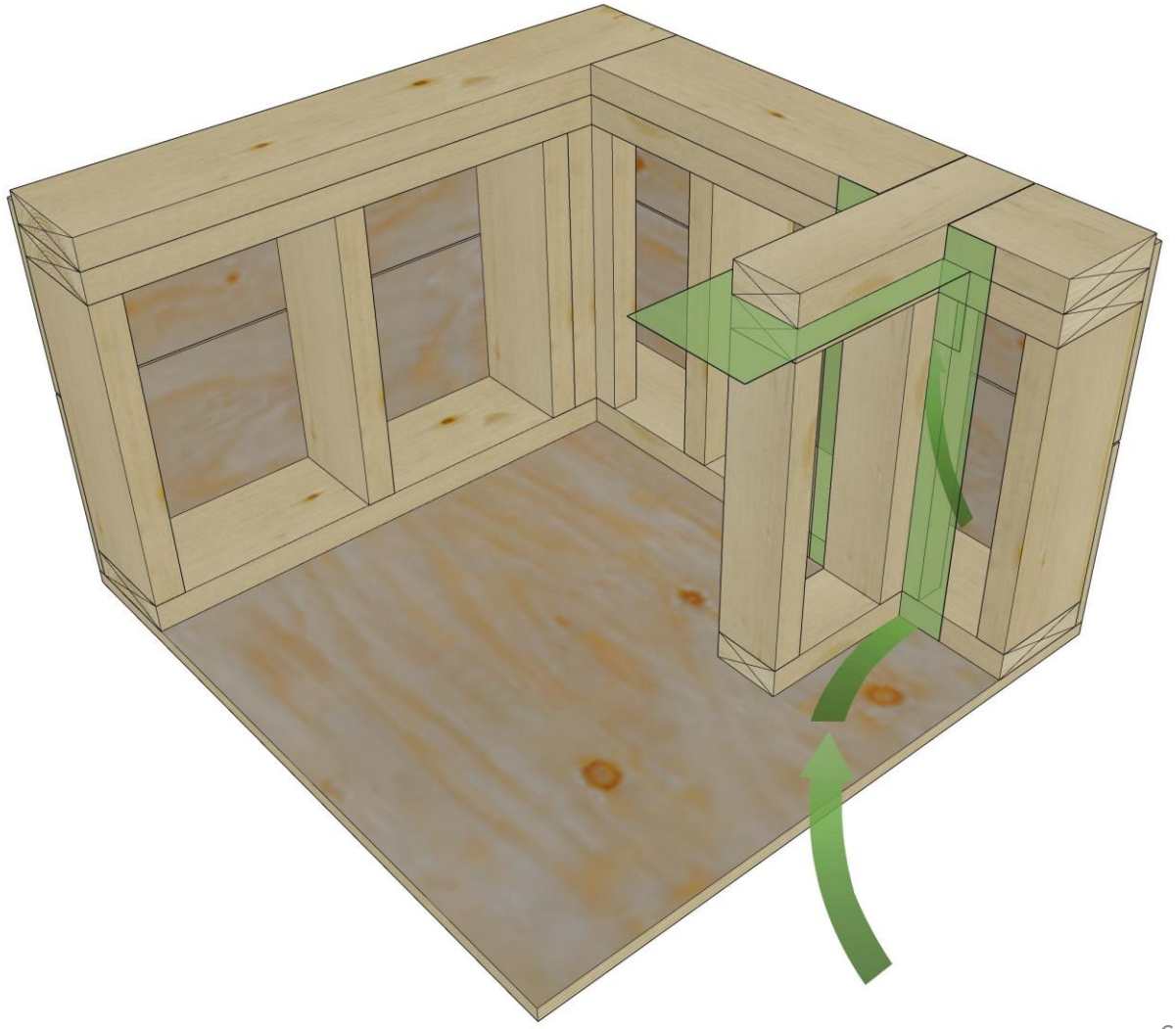
Important Detail: **Roof to Wall**

- Interior partition walls are always in the way



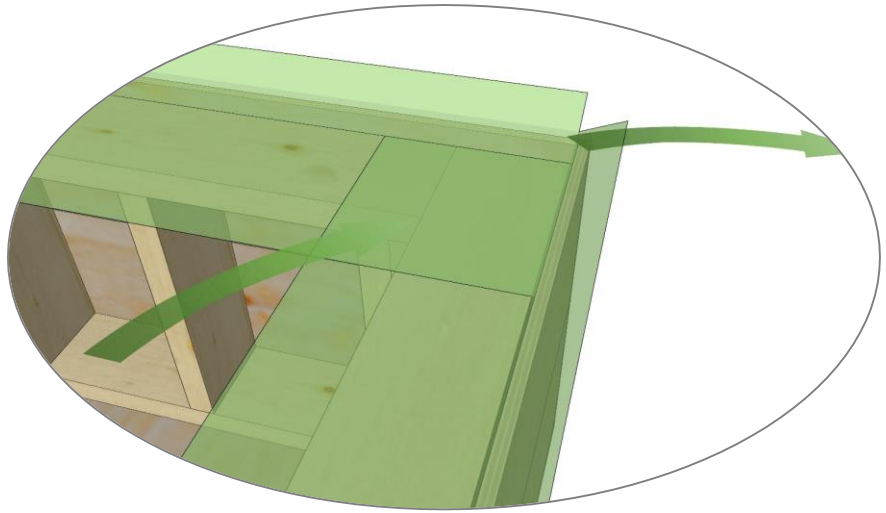
Important Detail: **Roof to Wall**

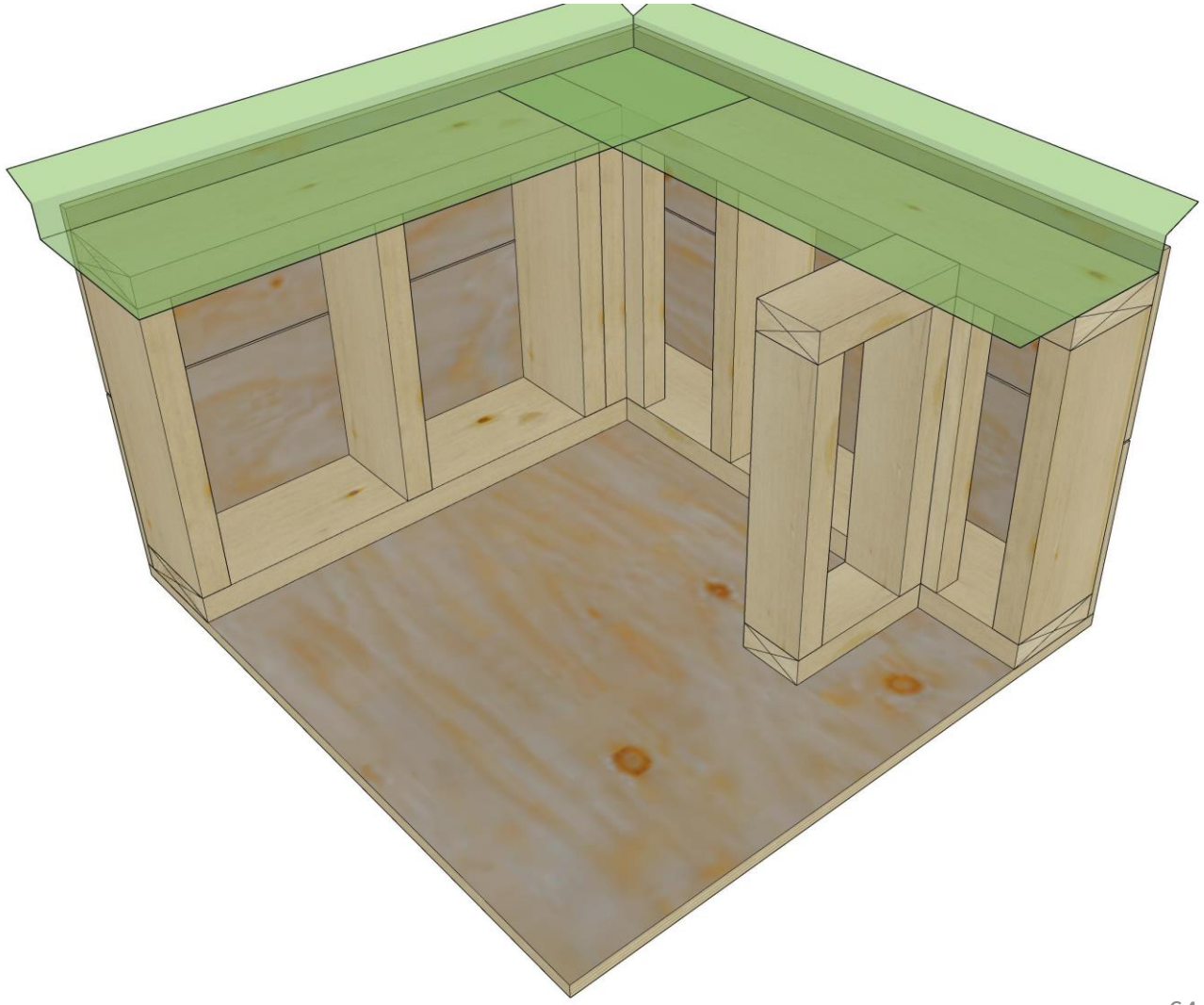
- Interior partition walls must be sealed behind before they are installed



Important Detail: **Roof to Wall**

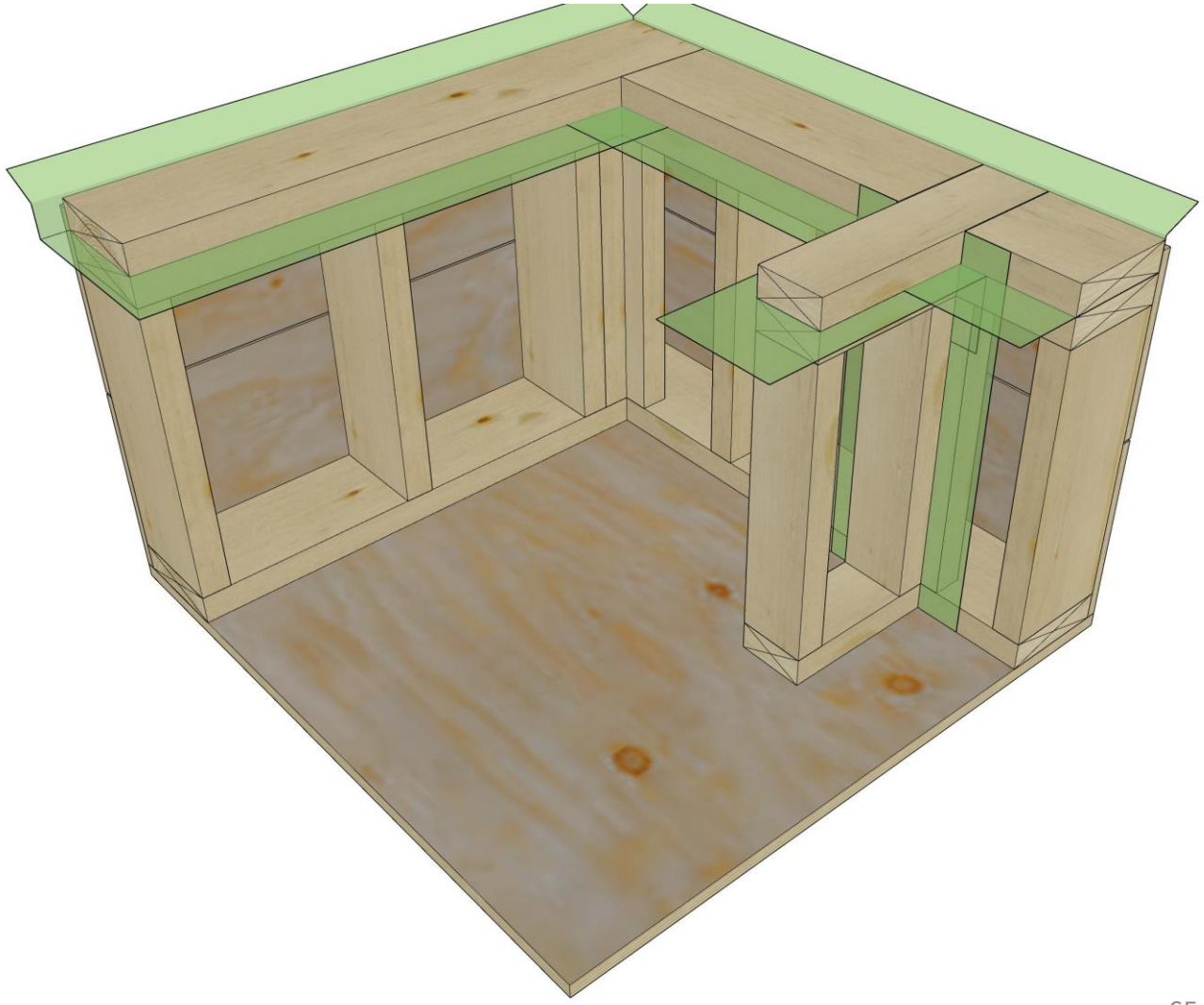
- Top plate pre-strip is difficult to make airtight





Important Detail: **Roof to Wall**

- Need to re-think this approach…

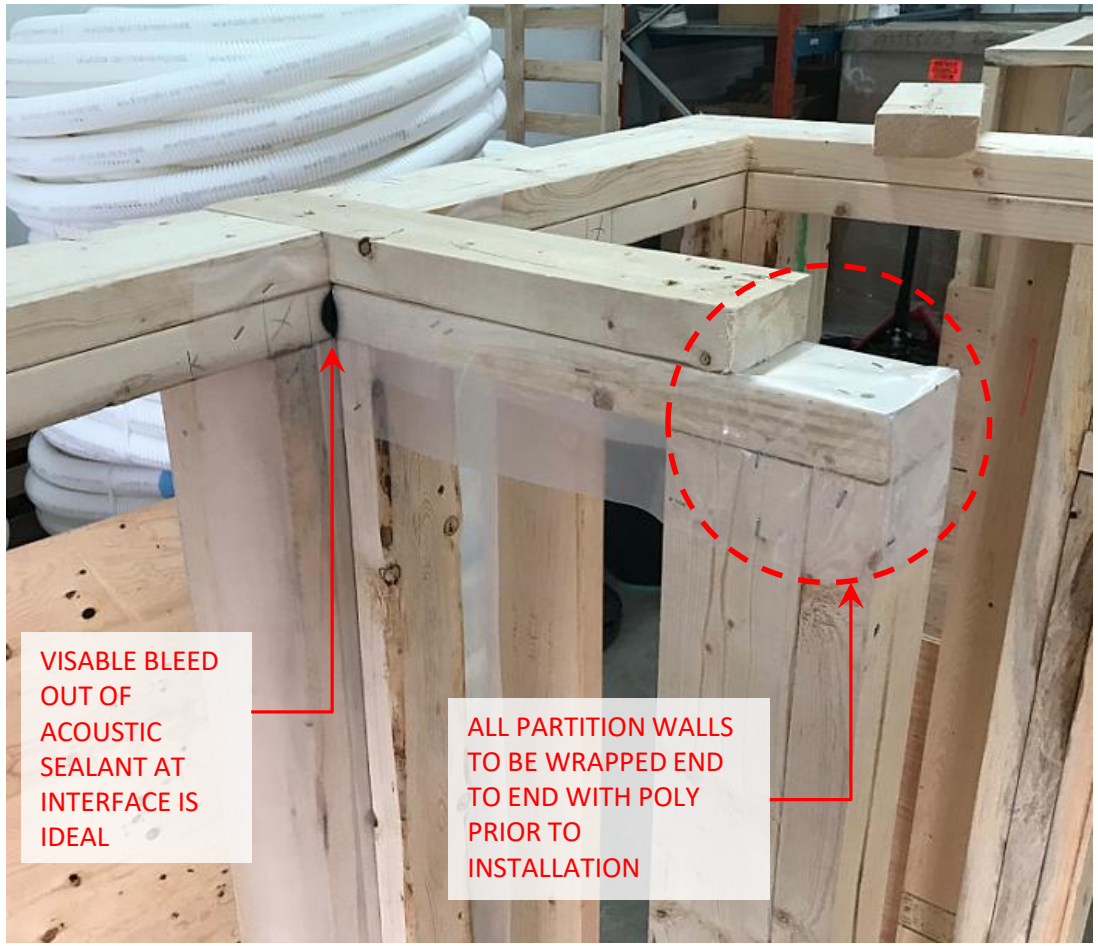


Roof to Wall Airtightness: Step by Step

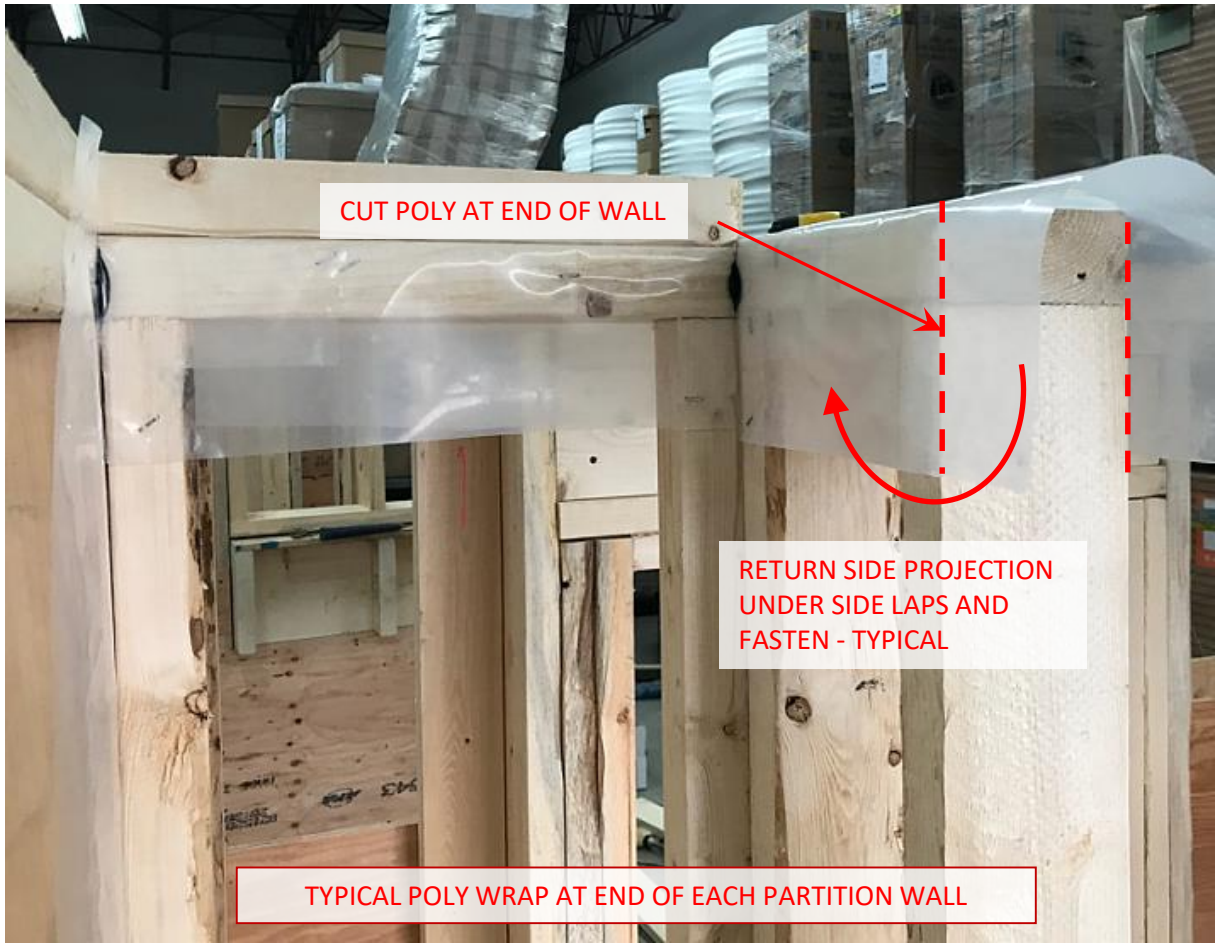
- Standard performance approach: Sealed pre-strip
- Higher-performance approach: Taped top plates

Sealed Top Plate Pre-strip

Sealed Top Plate Pre-strip

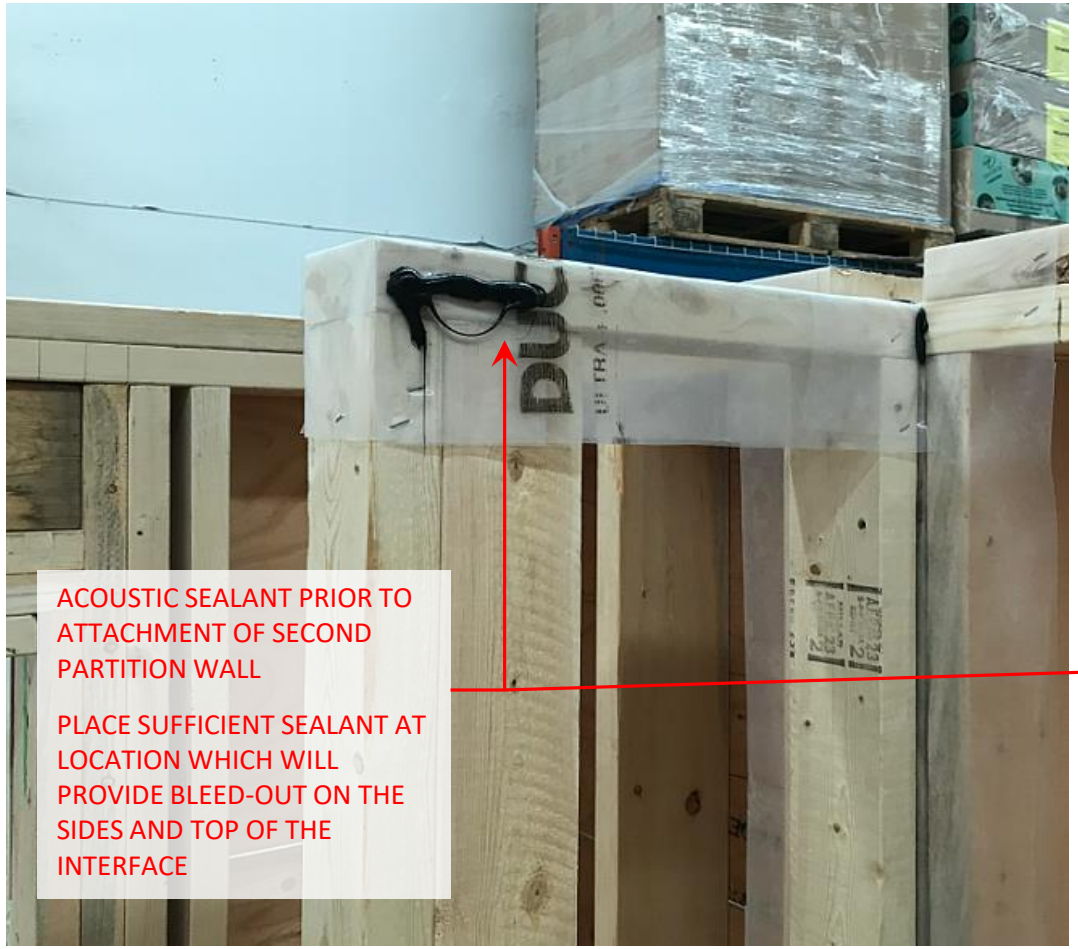


Sealed Top Plate Pre-strip

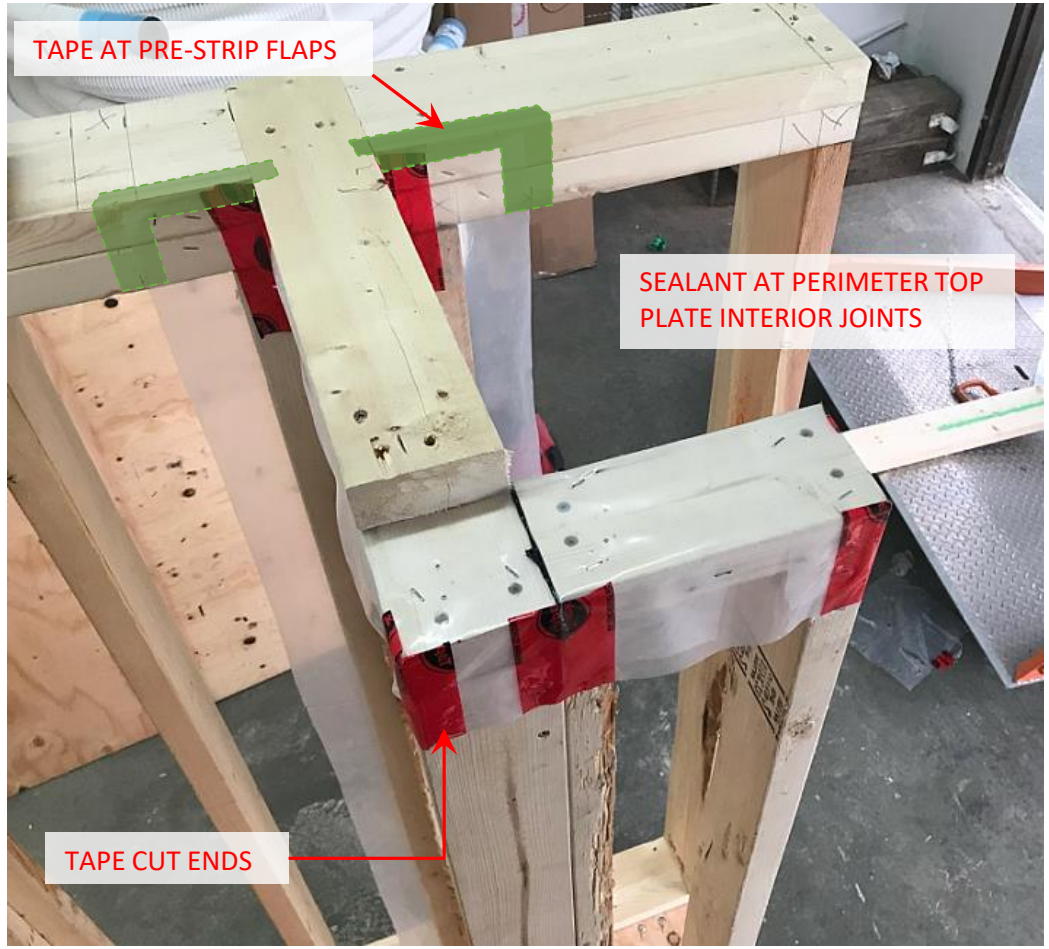


Sealed Top Plate Pre-strip

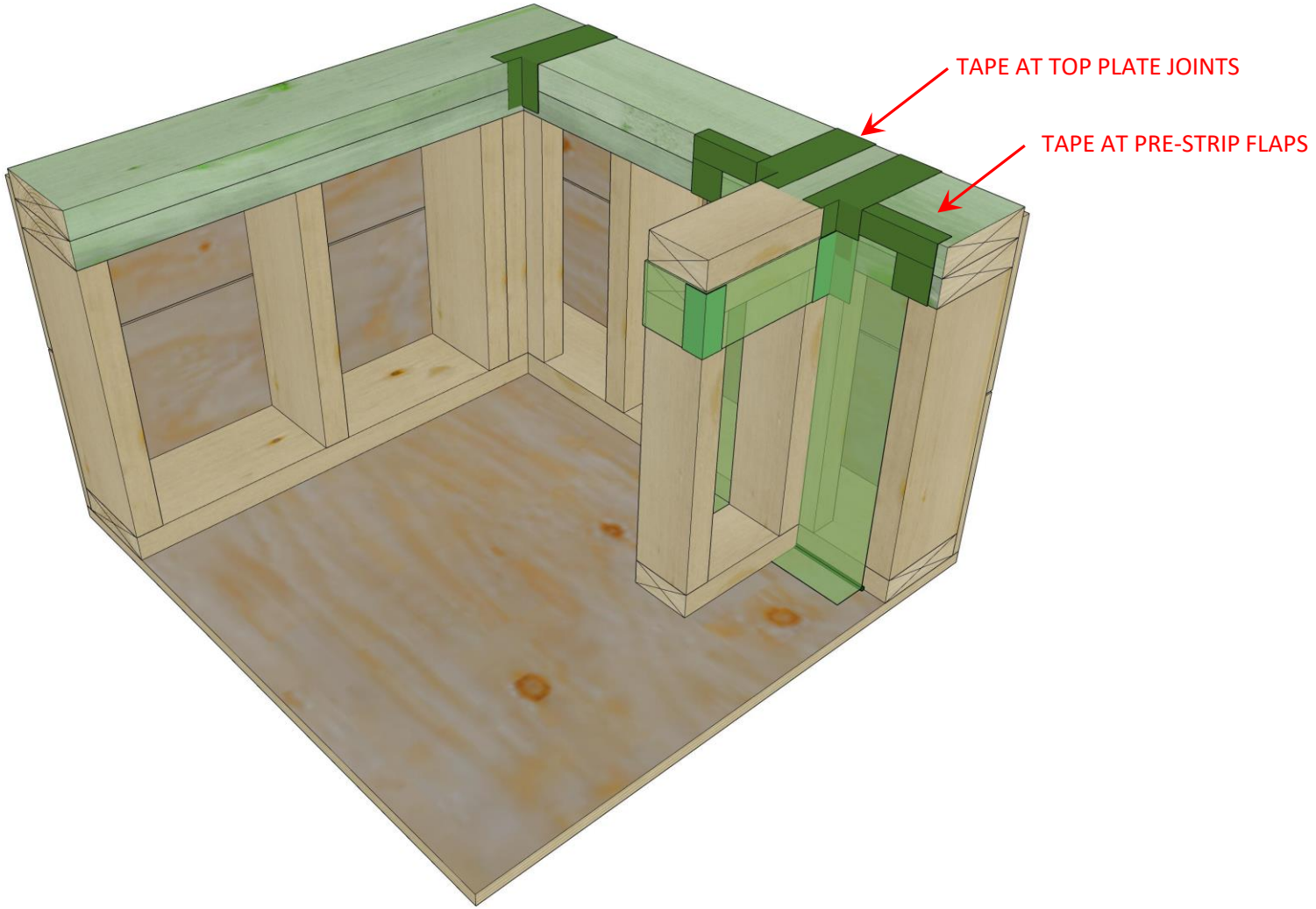
Sealed Top Plate Pre-strip



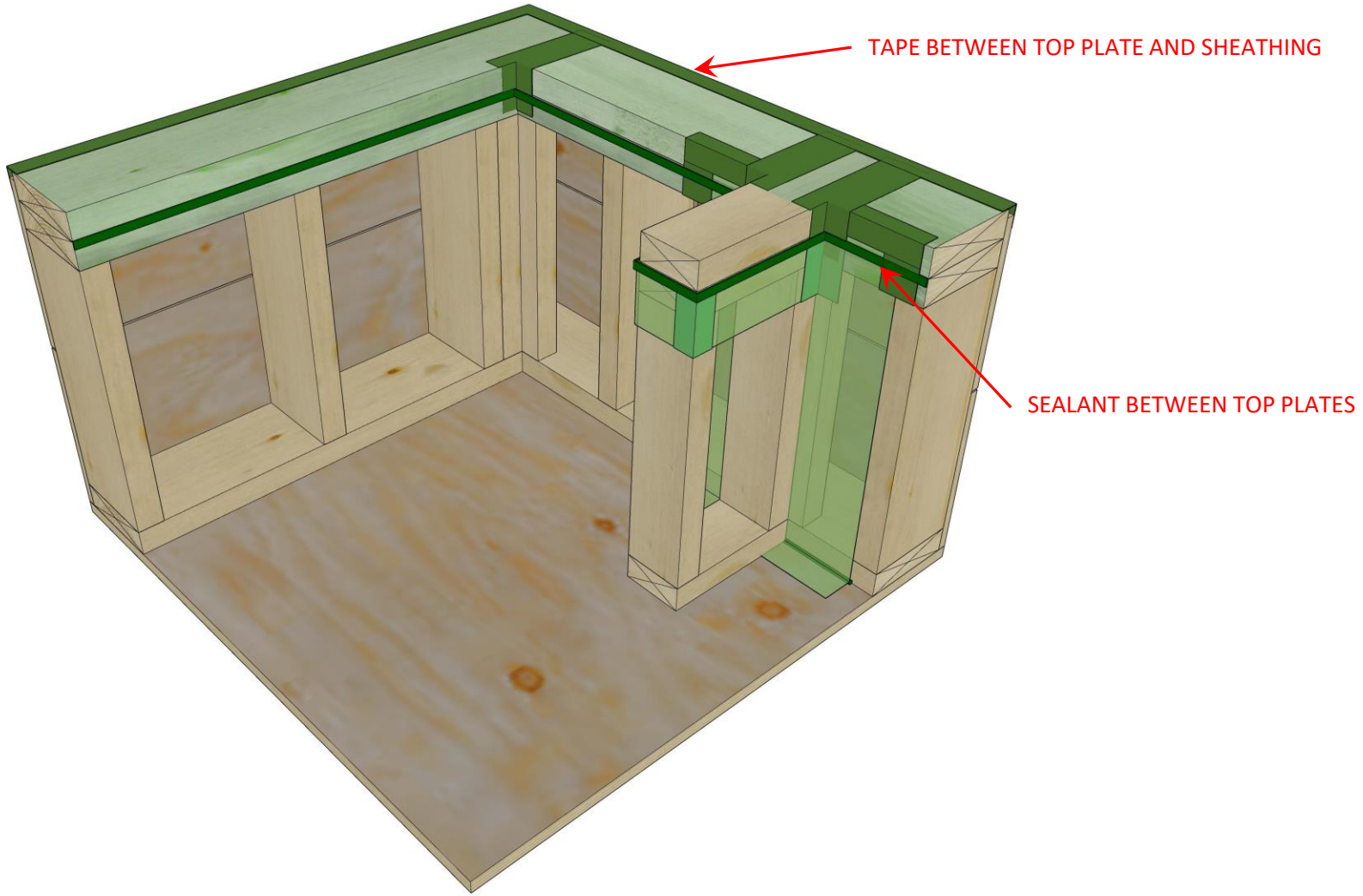
Sealed Top Plate Pre-strip – Exterior Transfer



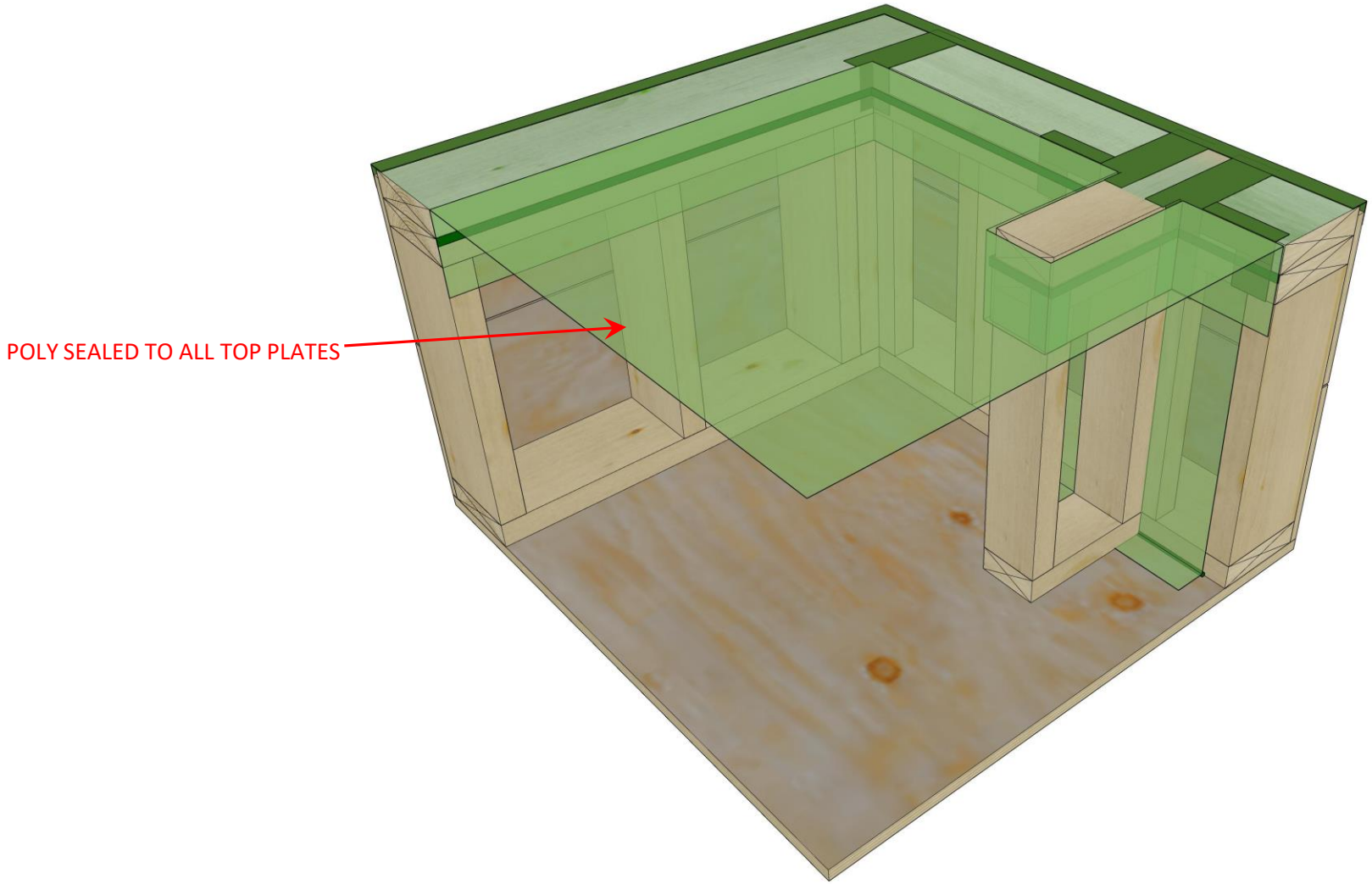
Sealed Top Plate Pre-strip – Exterior Transfer



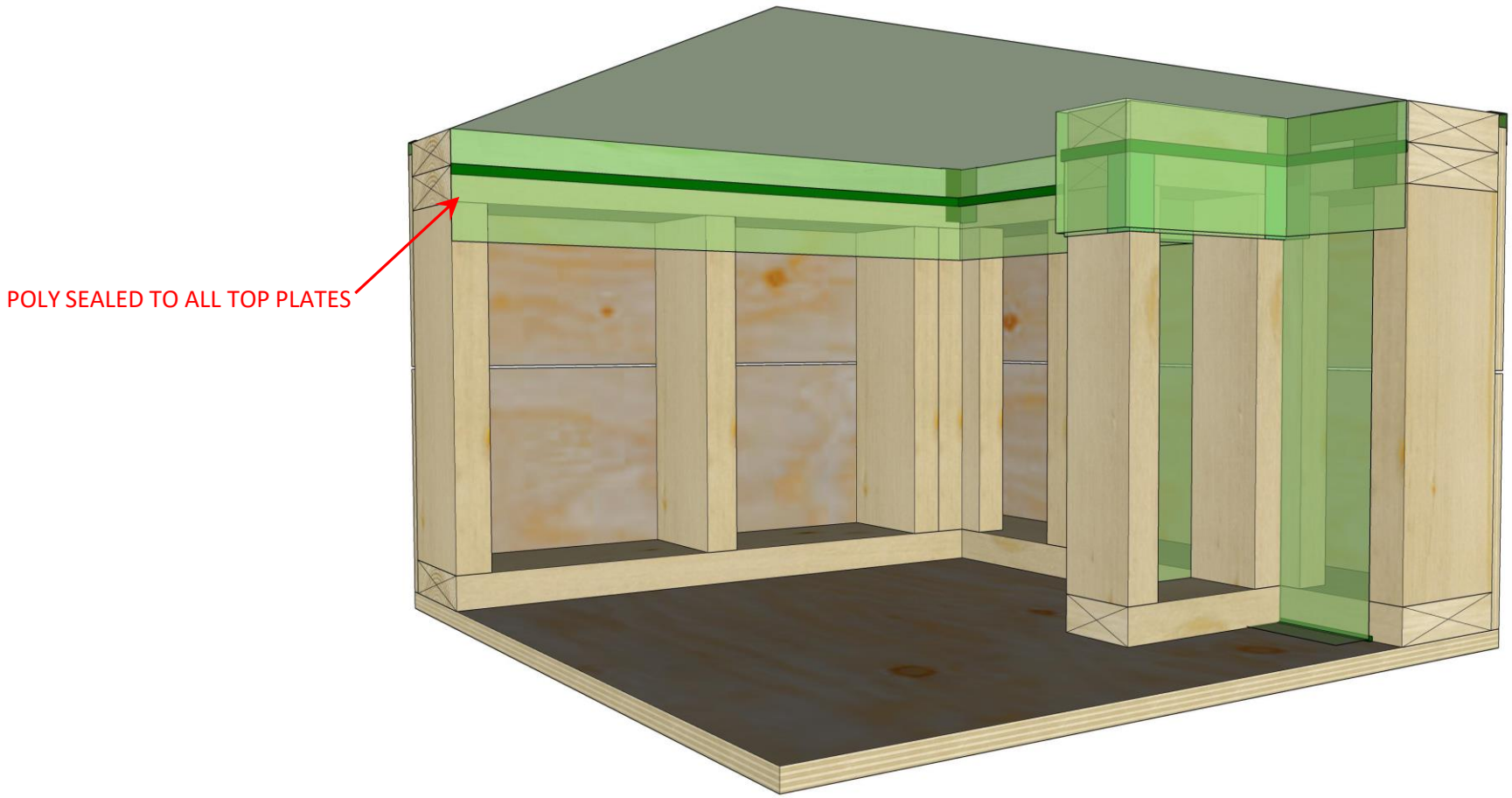
Sealed Top Plate Pre-strip – Exterior Transfer



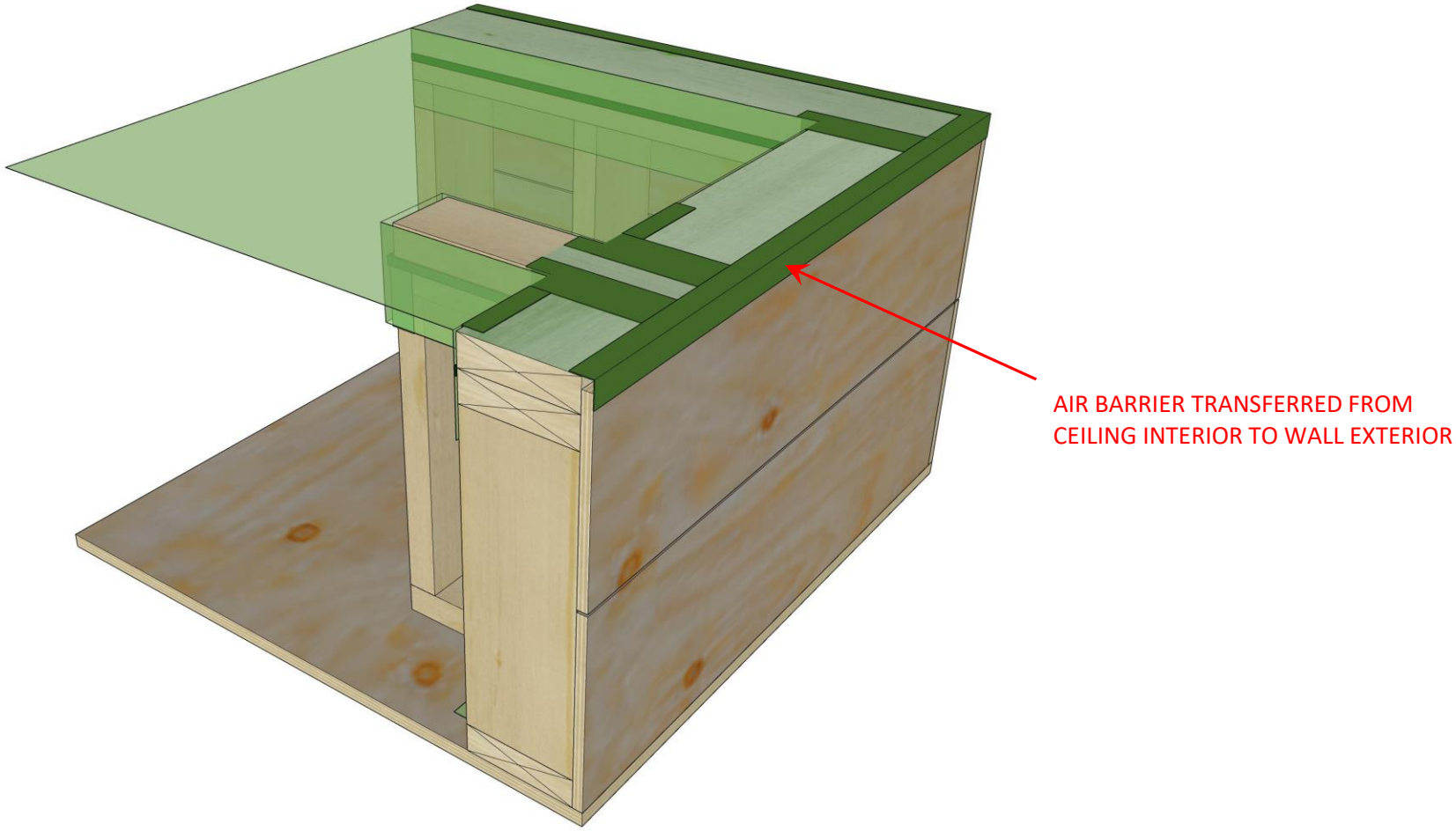
Sealed Top Plate Pre-strip – Exterior Transfer



Sealed Top Plate Pre-strip – Exterior Transfer

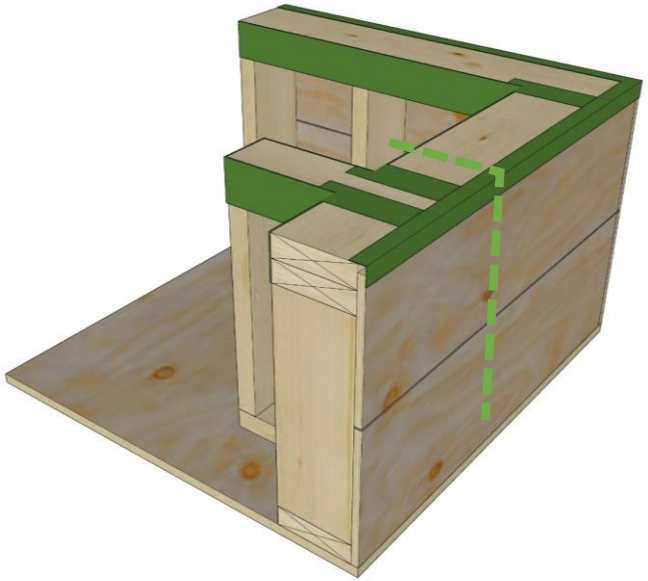


Sealed Top Plate Pre-strip – Exterior Transfer



Taped Top Plate Transition

- Taped top plates use high-performance tapes to make the top plates part of the air barrier.




CSTM
CSTM
CSTM

Discussion & Questions

BC Energy Step Code

Airtightness Training

Instructors:

James Bourget, ABET, RRO, CPHTP

Brandon Clevenger, Tim Bryant. Geoff Kirkpatrick, Albert Rooks

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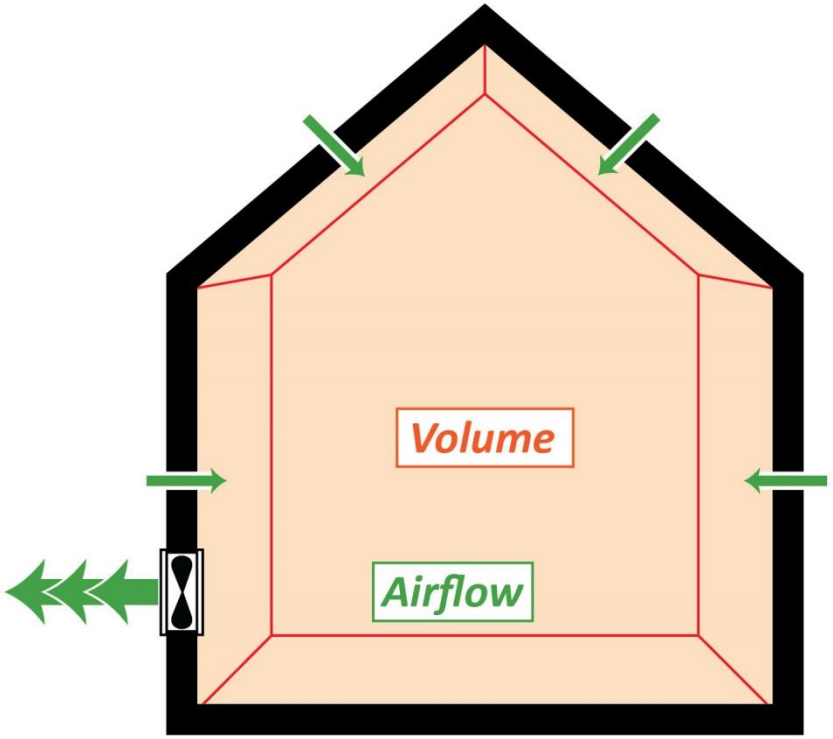
Airtightness



*Measured as **Air Leakage Rate** in **Air Changes per Hour** (ACH_{50})

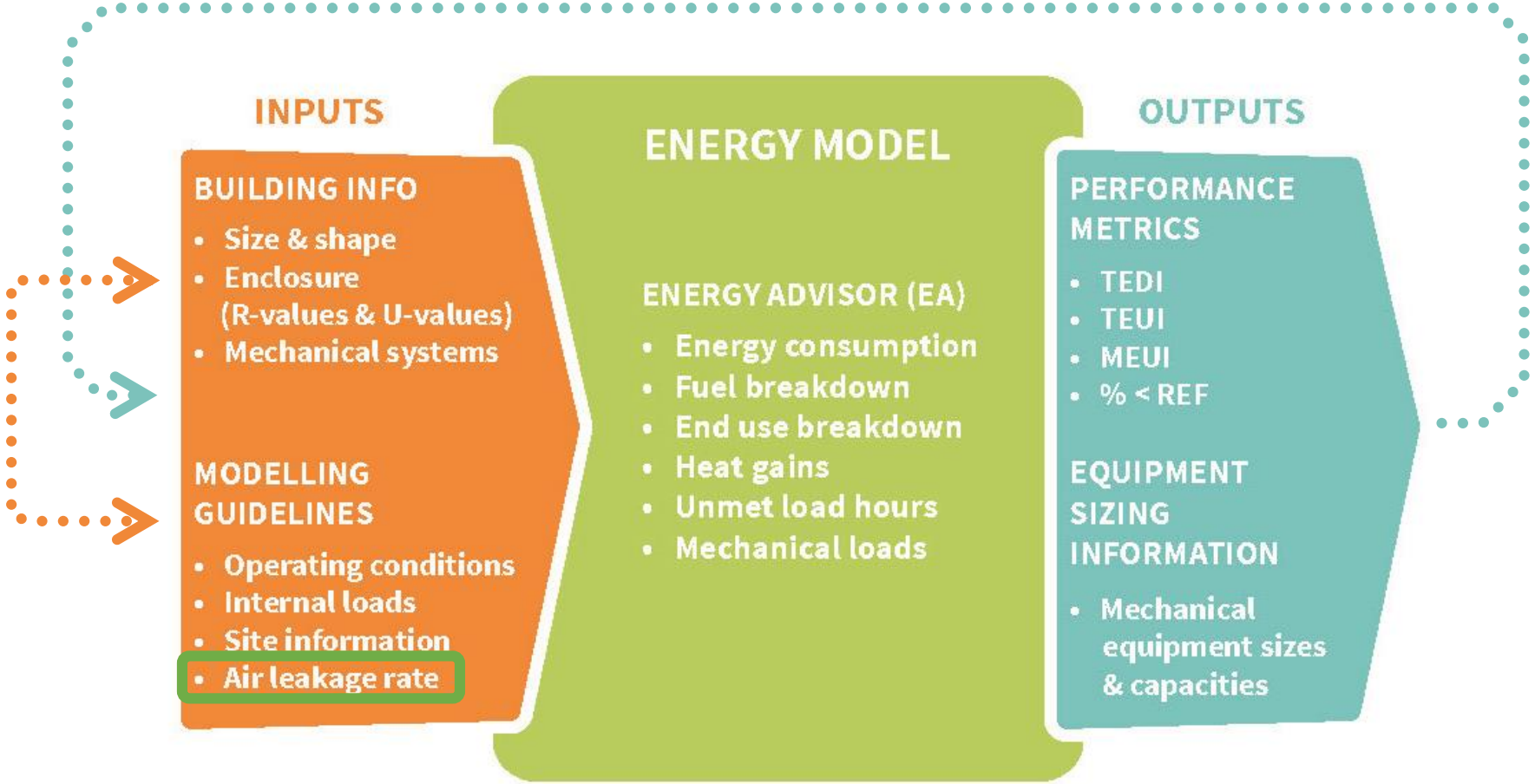
Step Code Airtightness

Airtightness

ACH

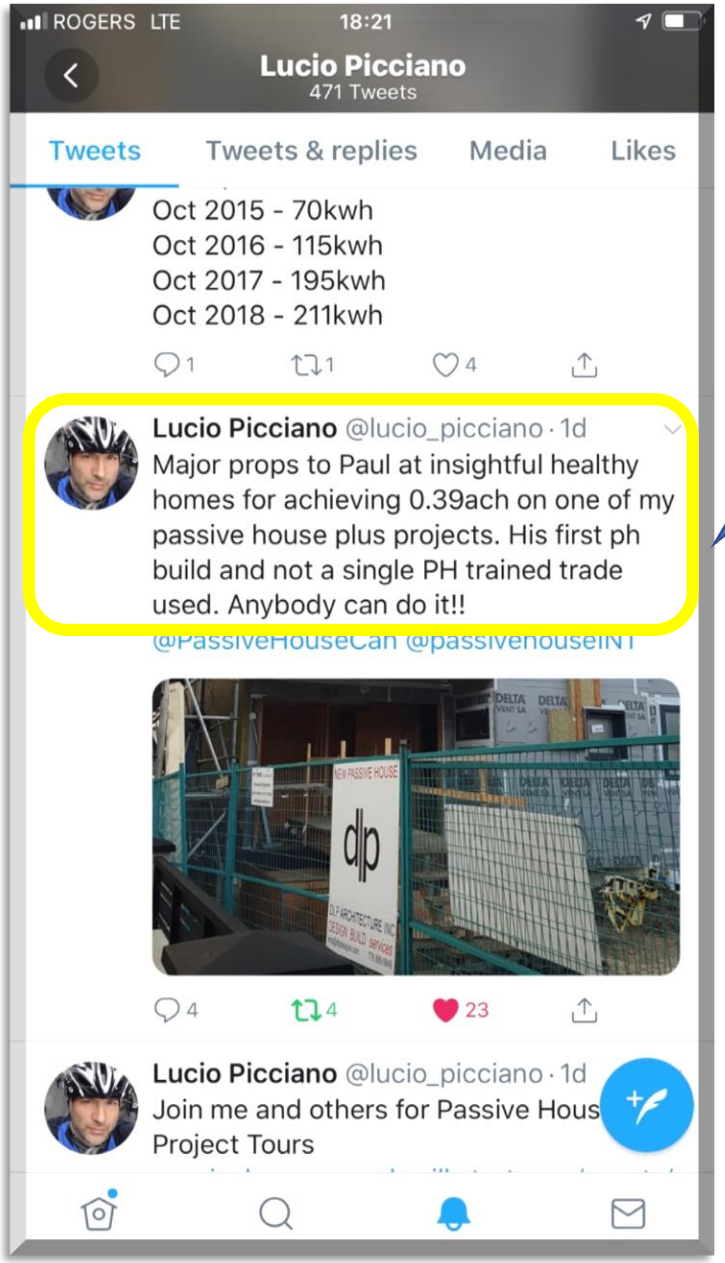
	Air Leakage Rate
STEP 1	?
STEP 2	≤ 3.0 ACH_{50}
STEP 3	≤ 2.5 ACH_{50}
STEP 4	≤ 1.5 ACH_{50}
STEP 5	≤ 1.0 ACH_{50}

Working with Energy Advisor



Twitter activity from a 2018 Vancouver project shows that airtightness is simple.

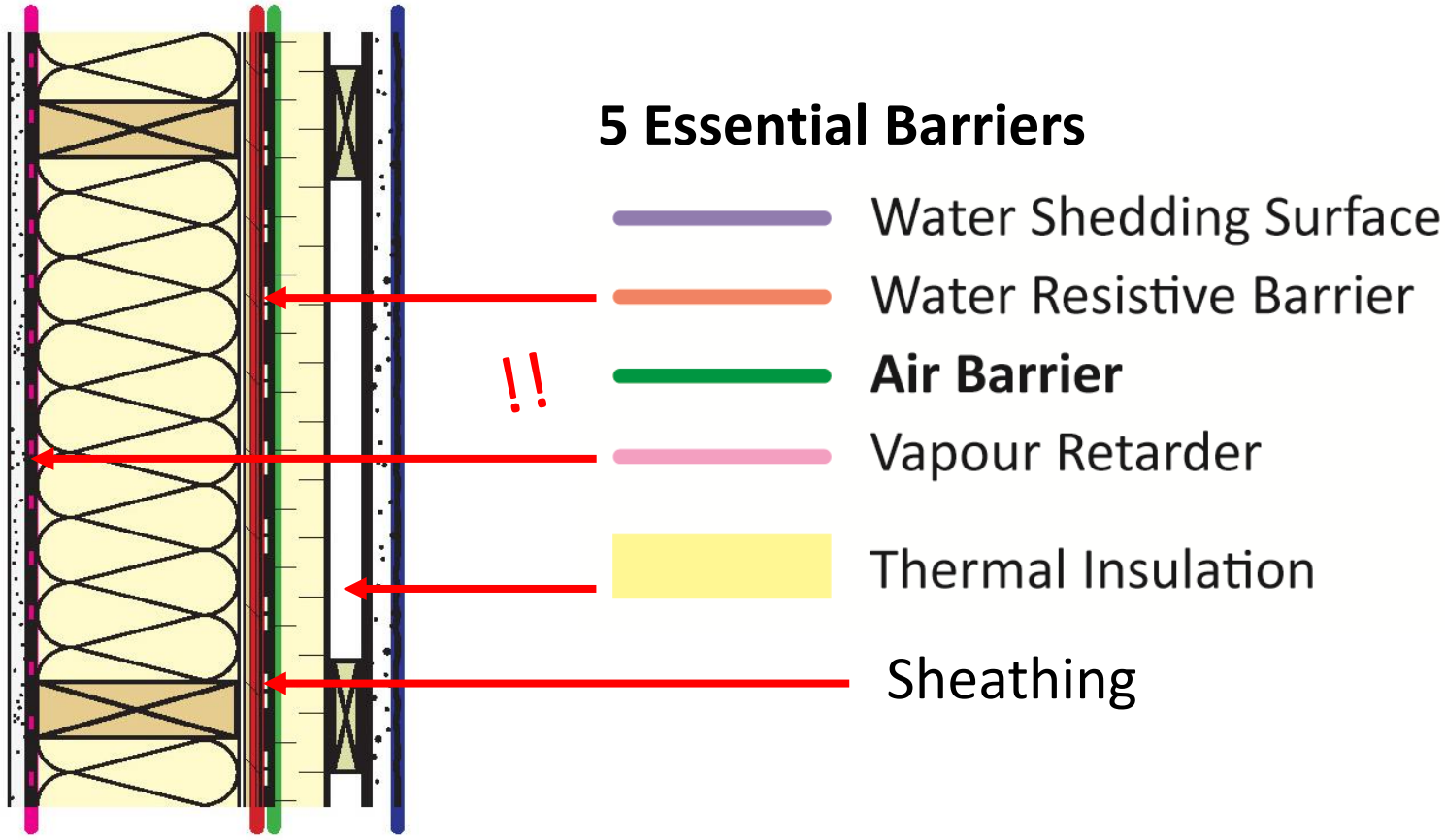
Anybody can do it.



0.39 ACH!

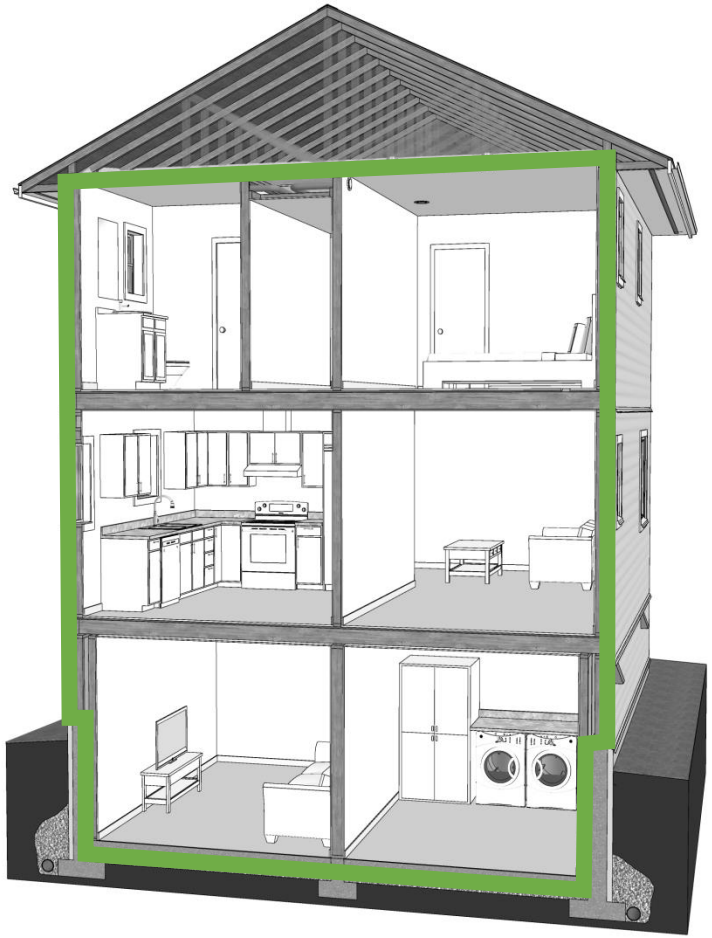
"His first PH build and not a single PH trained trade used. Anybody can do it!"

Which of these can act as an air barrier?



The **Air Barrier** is a complete line around the entire enclosure.

It’s the sum total of all of the parts, and all of the connections that are designated to the the “air barrier”.



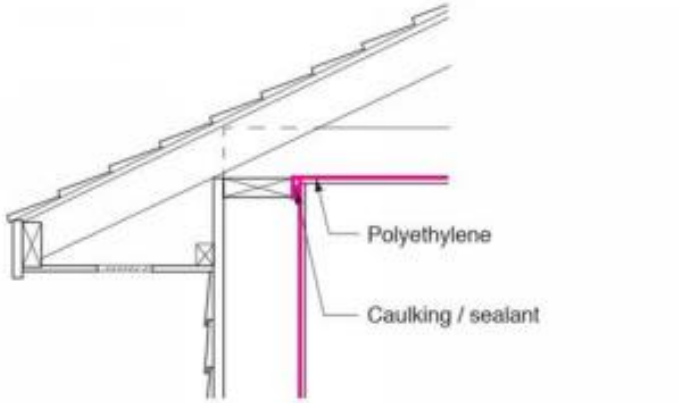
Wall Systems

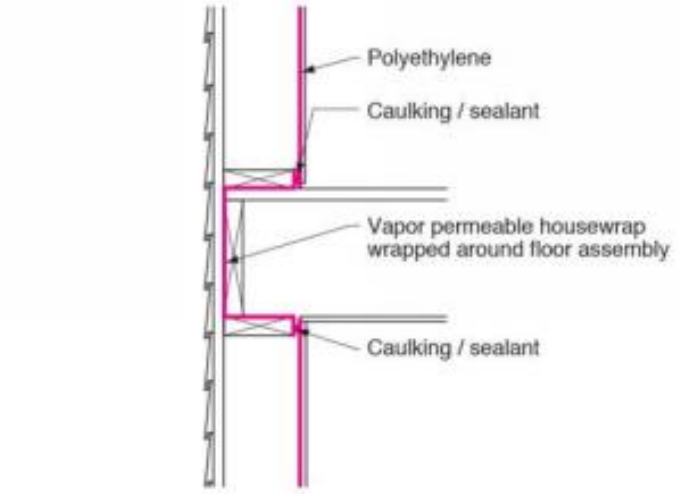
Two possible Pathways:

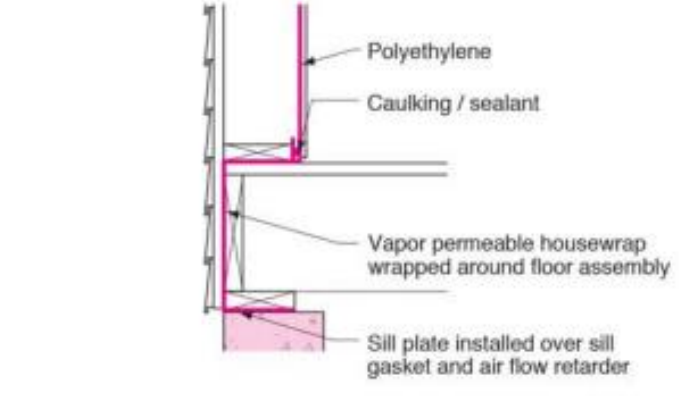
Interior Approach

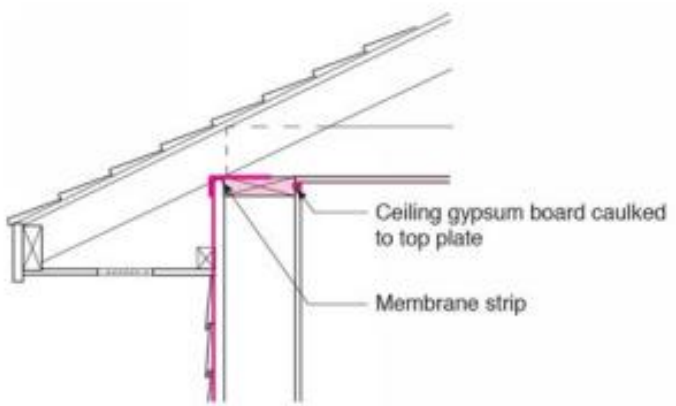
or

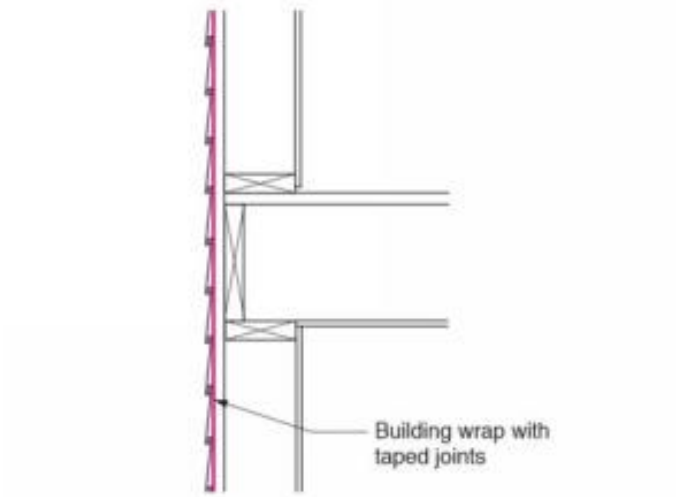
Exterior Approach

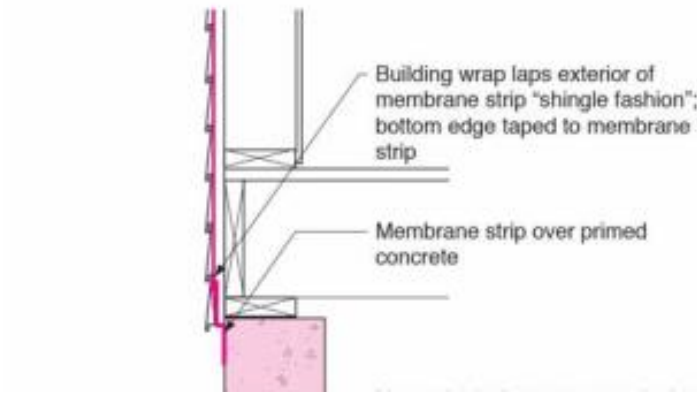








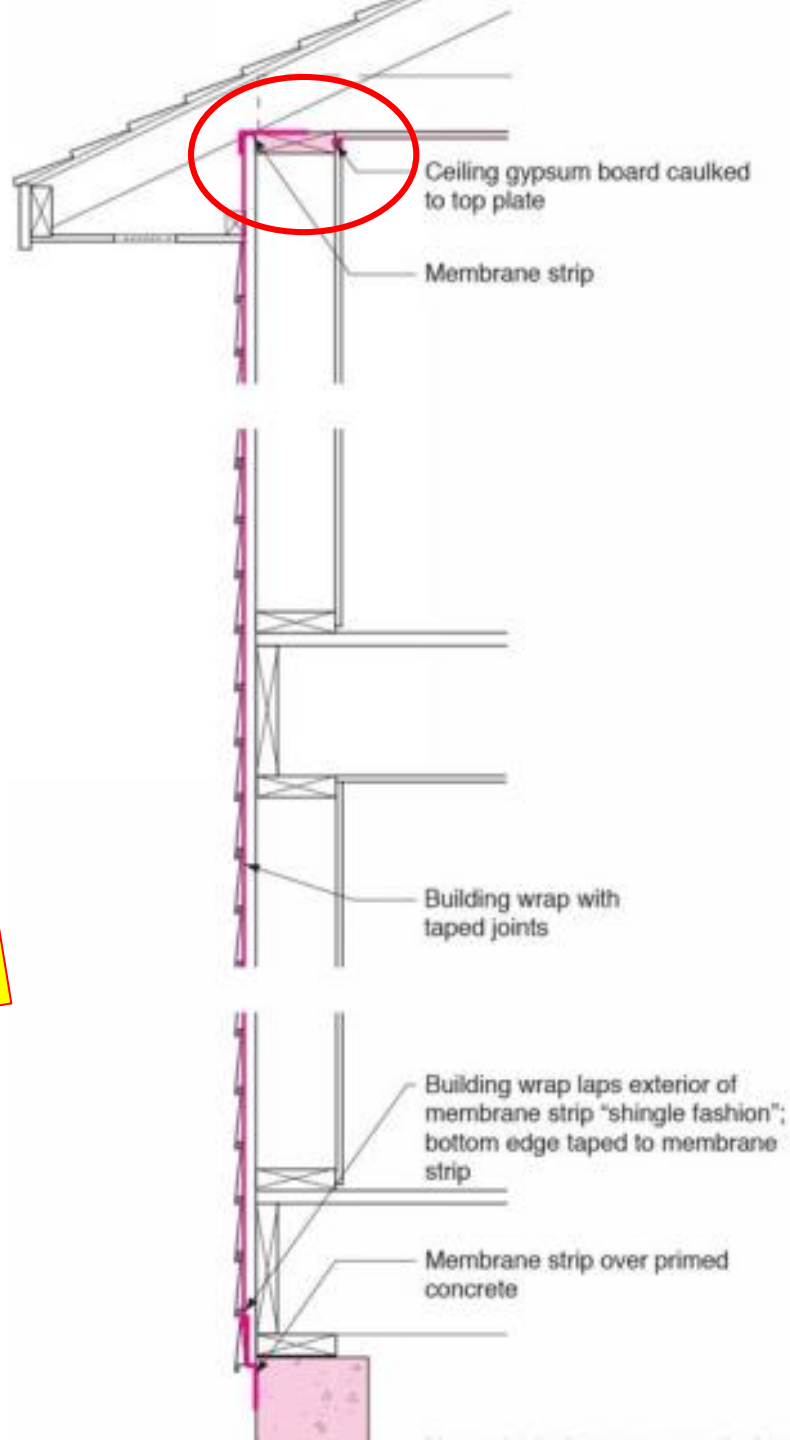




Air Barrier Details & Planning

- Water Resistive Barrier as Air Barrier
- Common exterior approach
- Fewer penetrations
- Inspectable

NEW - Need to connect exterior wall to ceiling




WHAT IS
YOUR PLAN?
WHAT IS
YOUR PLAN?


SIGA-Wigluv


SIGA-Wigluv
www.siga.ch

Testing Internal Air Barrier

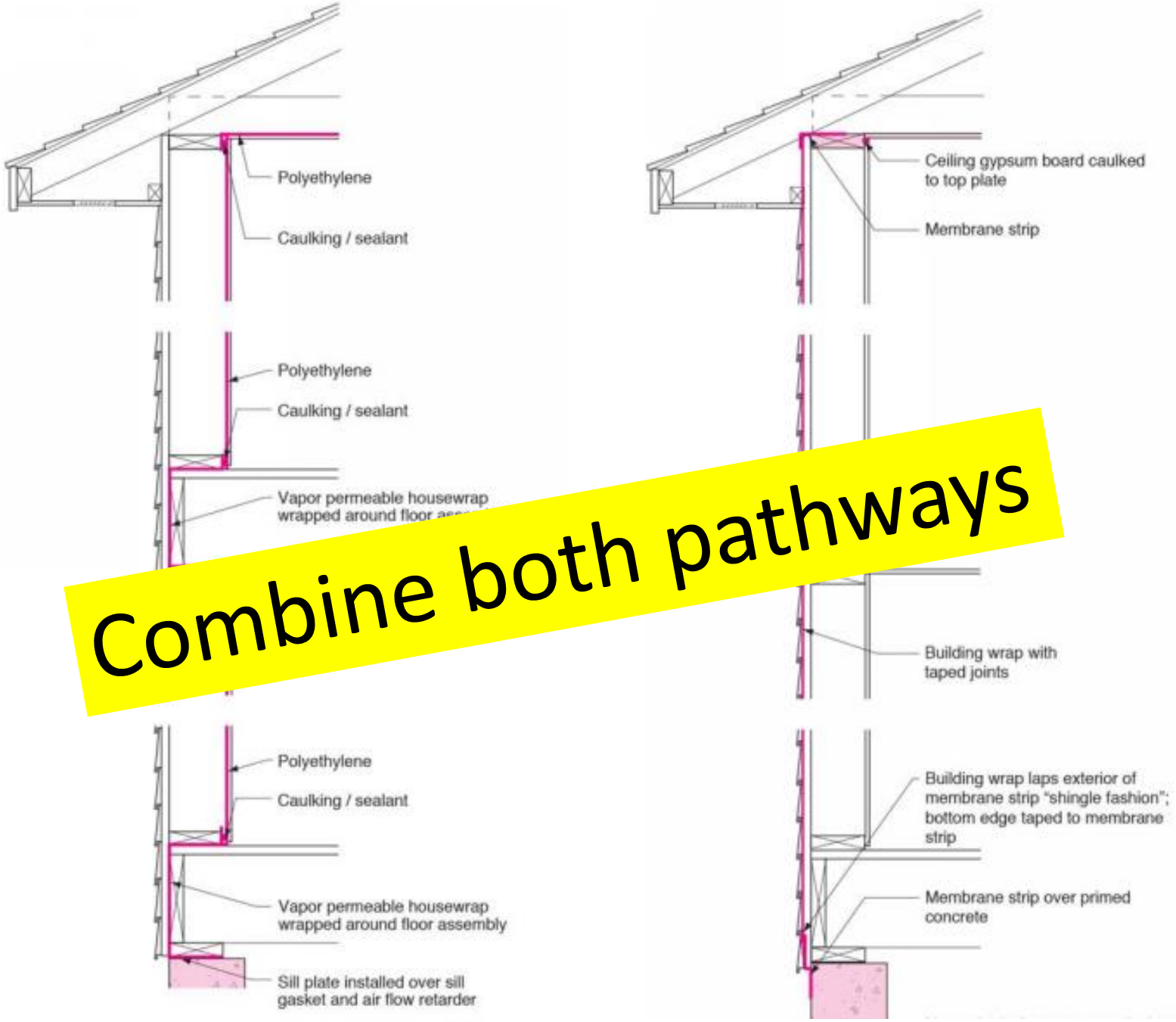
Testing External Air Barrier

Pick A Pathway

Interior Approach

or

Exterior Approach



Combine both pathways

When the walls use both an interior, AND exterior approach…What's left??